L Number	Hits	Search Text	DB	Time stamp
1 considered all	26	dynamic$5 with insurance with (process$3 or task or step)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/06/07 10:49
2	51	((establish$5 or determin$4) with (step or task or process) with dynamic$5) and insurance	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/06/07 11:07
3	173	((establish$5 or determin$4) with (step or task or process) with dynamic$5) and 705/$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/06/07 11:07
6	2	("6505176").PN.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/06/07 16:41
7 considered title	242	aquila$.in.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/06/07 16:41

US006199115B1

(12) **United States Patent**
DiRienzo

(10) **Patent No.: US 6,199,115 B1**
(45) **Date of Patent: Mar. 6, 2001**

(54) **ATTACHMENT INTEGRATED CLAIMS SYSTEM AND OPERATING METHOD THEREFOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/587,284**

(22) Filed: **Jun. 5, 2000**

Related U.S. Application Data

(63) Continuation of application No. 09/232,805, filed on Jan. 19, 1999, now Pat. No. 6,076,066, which is a continuation of application No. 08/824,010, filed on Mar. 25, 1997, now Pat. No. 6,003,007

(60) Provisional application No. 60/014,427, filed on Mar. 28, 1996.

(51) **Int. Cl.**[7] **G06F 15/16**

(52) **U.S. Cl.** **709/236**; 709/237; 709/245; 709/246

(58) **Field of Search** 709/227, 228, 709/230, 236, 237, 245, 246

(56) **References Cited**

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Primary Examiner—Thomas R. Peeso
(74) *Attorney, Agent, or Firm*—Westerlund Powell, P.C.; Raymond H. J. Powell, Jr.; Robert A. Westerlund

(57) **ABSTRACT**

An attachment integrated claims (AIC) system includes an e-mail form (with specific fields that must be filled out) that adjusts itself, in both information required and formatting, to meet the demands of the receiving party. It is particularly advantageous for Electronic Data Interchange (EDI) situations where a user must send similar (but not necessarily identical) messages to several organizations. This is particularly important where, once an e-mail is received by those organizations, the information in the message must be digitally integrated into differing legacy information systems. In other words, the AIC system permits transmission of a dynamic claim form and integrated attachment to an insurance carrier via a non-clearinghouse communications channel. An AIC system including several computers connected via a communications channel, an electronic file, and an operating method therefor are also described.

43 Claims, 8 Drawing Sheets

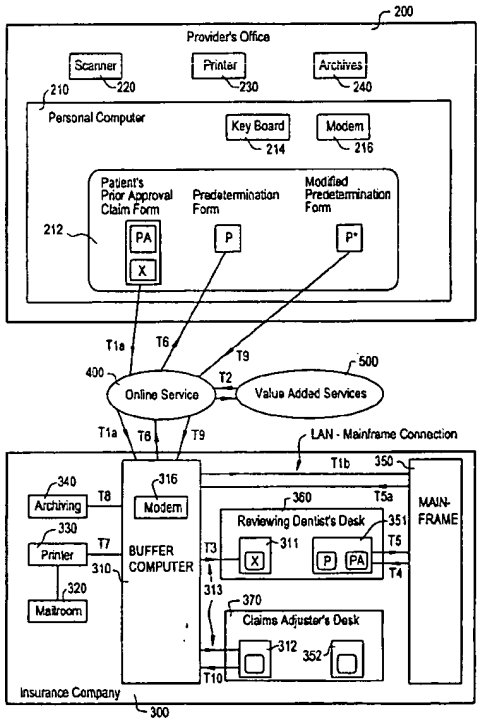


FIG. 1

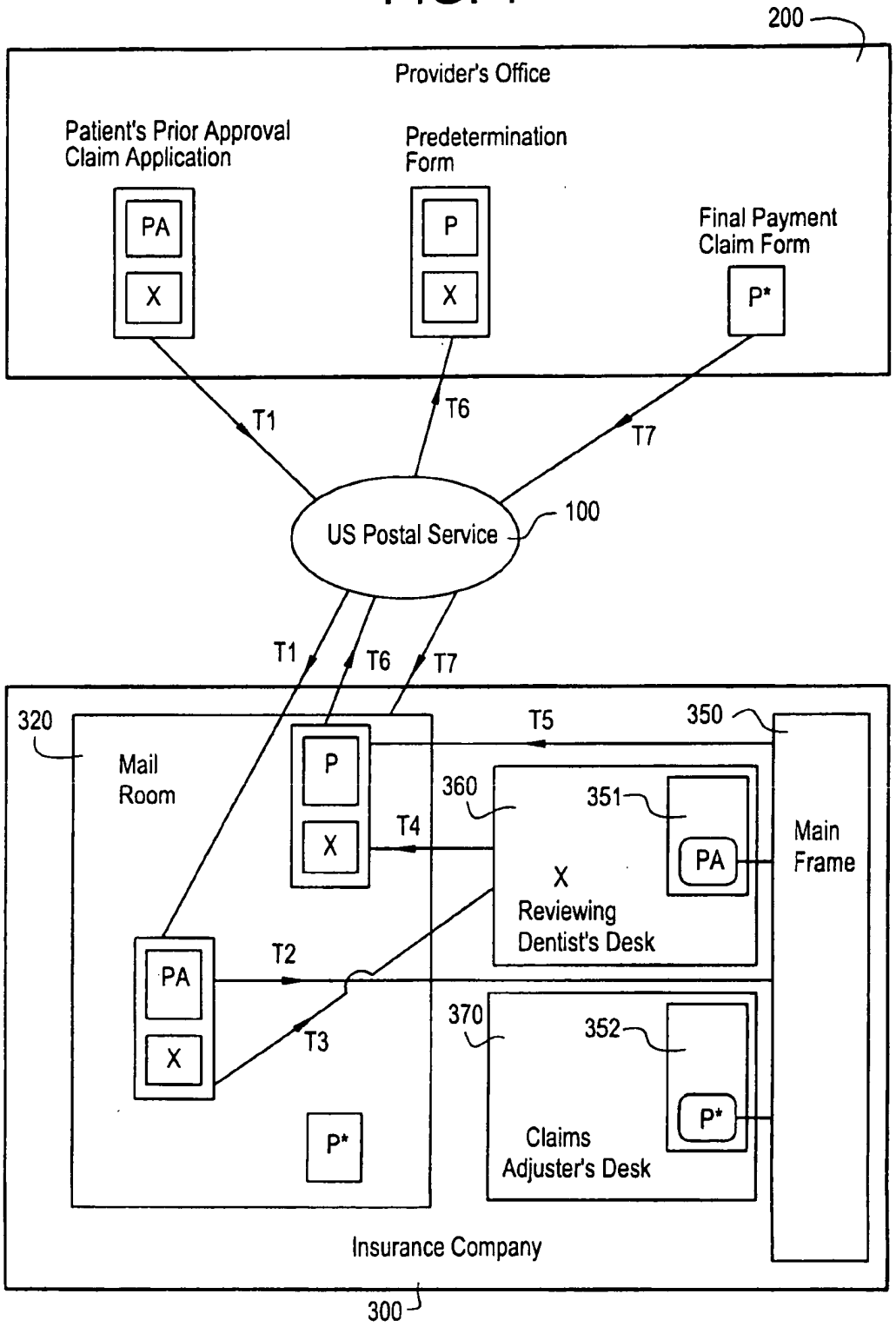

200
Provider's Office
Patient's Prior Approval Claim Application
Predetermination Form
Final Payment Claim Form
PA
X
P
X
P*
T1
T6
T7
US Postal Service
100
T1
T6
T7
320
Mail Room
P
X
T5
350
360
T4
351
PA
X
Reviewing Dentist's Desk
Main Frame
PA
X
T2
T3
370
352
P*
Claims Adjuster's Desk
P*
Insurance Company
300

FIG. 2A

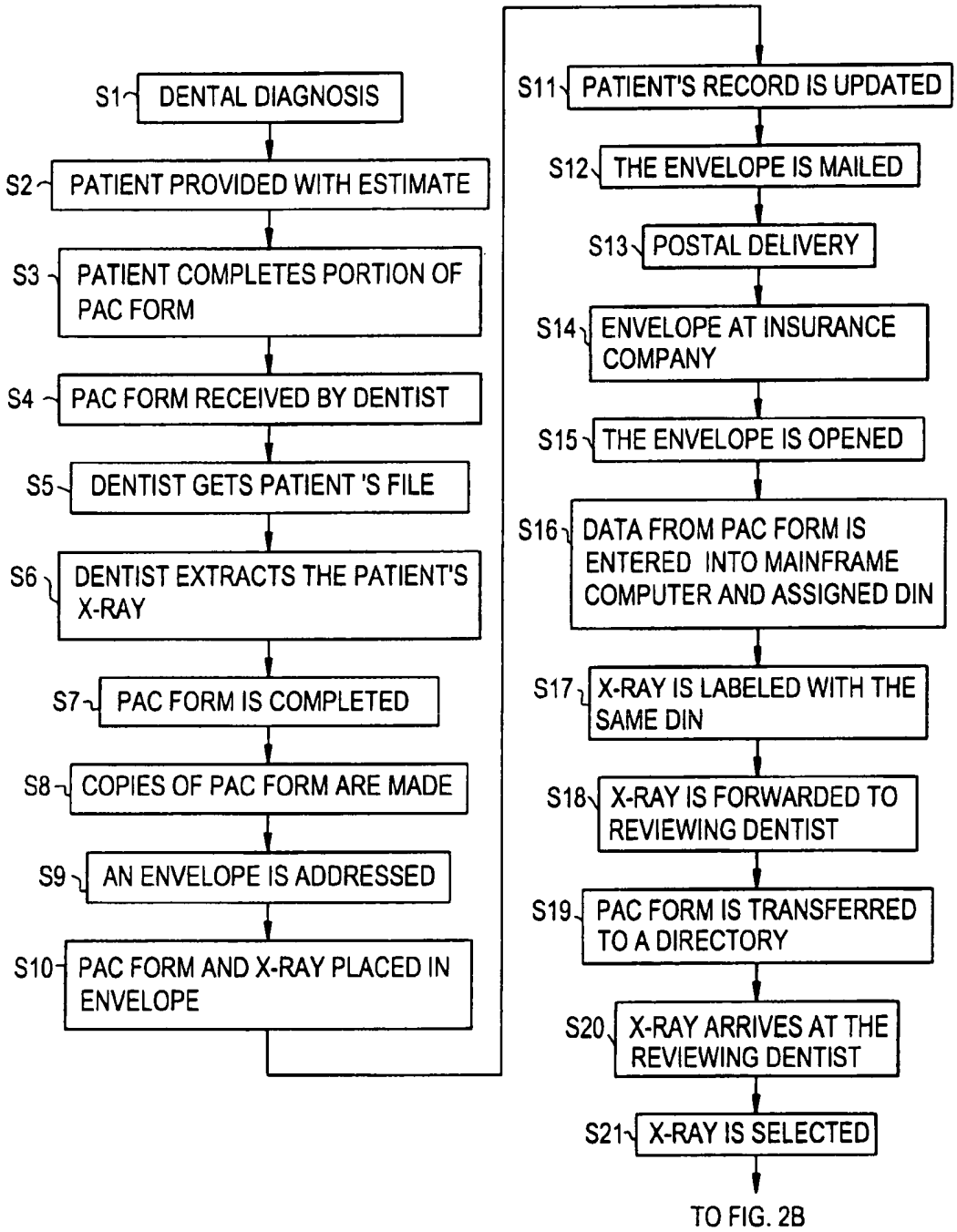

S1 DENTAL DIAGNOSIS
S2 PATIENT PROVIDED WITH ESTIMATE
S3 PATIENT COMPLETES PORTION OF PAC FORM
S4 PAC FORM RECEIVED BY DENTIST
S5 DENTIST GETS PATIENT 'S FILE
S6 DENTIST EXTRACTS THE PATIENT'S X-RAY
S7 PAC FORM IS COMPLETED
S8 COPIES OF PAC FORM ARE MADE
S9 AN ENVELOPE IS ADDRESSED
S10 PAC FORM AND X-RAY PLACED IN ENVELOPE
S11 PATIENT'S RECORD IS UPDATED
S12 THE ENVELOPE IS MAILED
S13 POSTAL DELIVERY
S14 ENVELOPE AT INSURANCE COMPANY
S15 THE ENVELOPE IS OPENED
S16 DATA FROM PAC FORM IS ENTERED INTO MAINFRAME COMPUTER AND ASSIGNED DIN
S17 X-RAY IS LABELED WITH THE SAME DIN
S18 X-RAY IS FORWARDED TO REVIEWING DENTIST
S19 PAC FORM IS TRANSFERRED TO A DIRECTORY
S20 X-RAY ARRIVES AT THE REVIEWING DENTIST
S21 X-RAY IS SELECTED
TO FIG. 2B

FIG. 2B

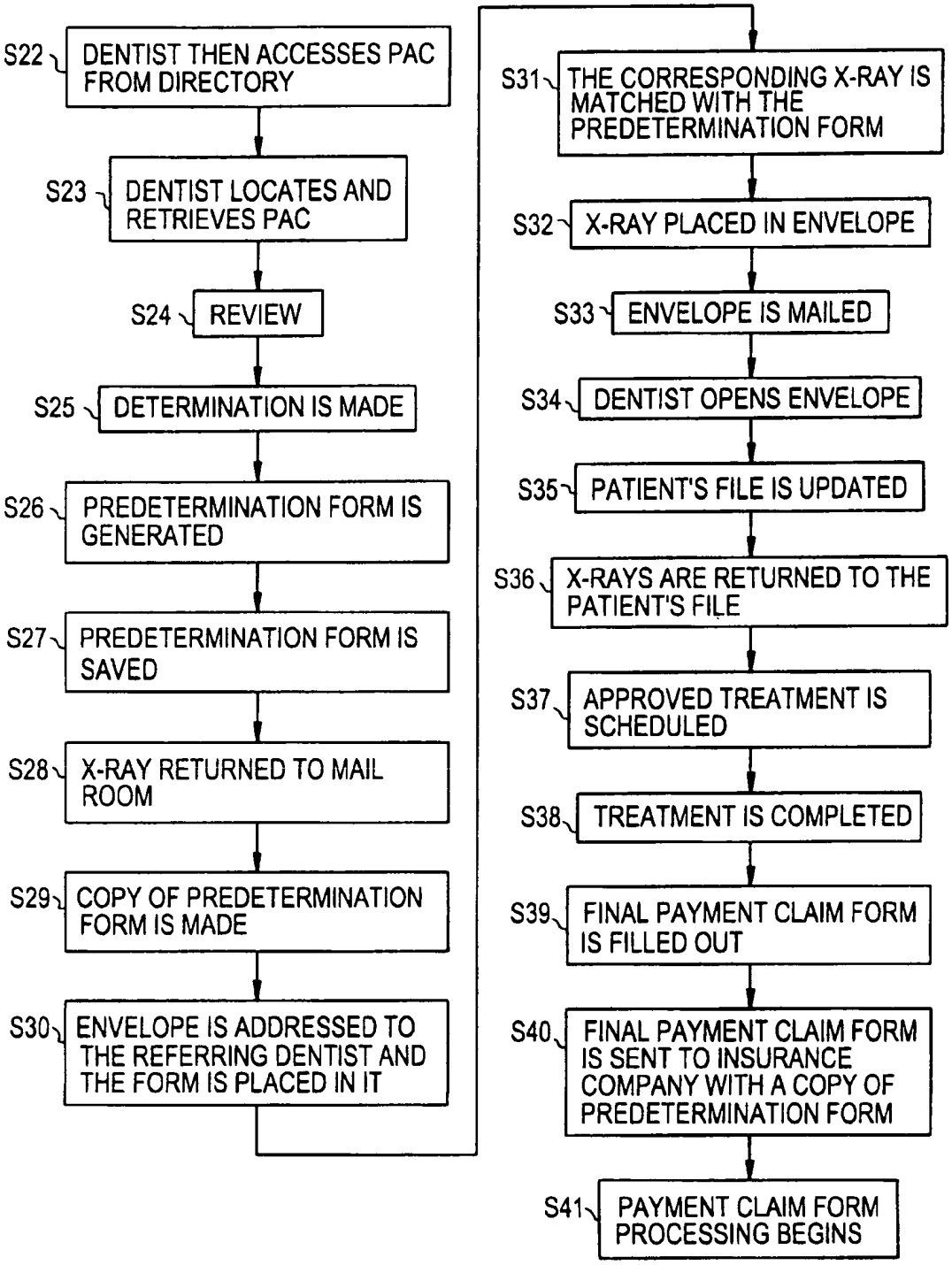

S22
DENTIST THEN ACCESSES PAC FROM DIRECTORY
S23
DENTIST LOCATES AND RETRIEVES PAC
S24
REVIEW
S25
DETERMINATION IS MADE
S26
PREDETERMINATION FORM IS GENERATED
S27
PREDETERMINATION FORM IS SAVED
S28
X-RAY RETURNED TO MAIL ROOM
S29
COPY OF PREDETERMINATION FORM IS MADE
S30
ENVELOPE IS ADDRESSED TO THE REFERRING DENTIST AND THE FORM IS PLACED IN IT
S31
THE CORRESPONDING X-RAY IS MATCHED WITH THE PREDETERMINATION FORM
S32
X-RAY PLACED IN ENVELOPE
S33
ENVELOPE IS MAILED
S34
DENTIST OPENS ENVELOPE
S35
PATIENT'S FILE IS UPDATED
S36
X-RAYS ARE RETURNED TO THE PATIENT'S FILE
S37
APPROVED TREATMENT IS SCHEDULED
S38
TREATMENT IS COMPLETED
S39
FINAL PAYMENT CLAIM FORM IS FILLED OUT
S40
FINAL PAYMENT CLAIM FORM IS SENT TO INSURANCE COMPANY WITH A COPY OF PREDETERMINATION FORM
S41
PAYMENT CLAIM FORM PROCESSING BEGINS

FIG. 3

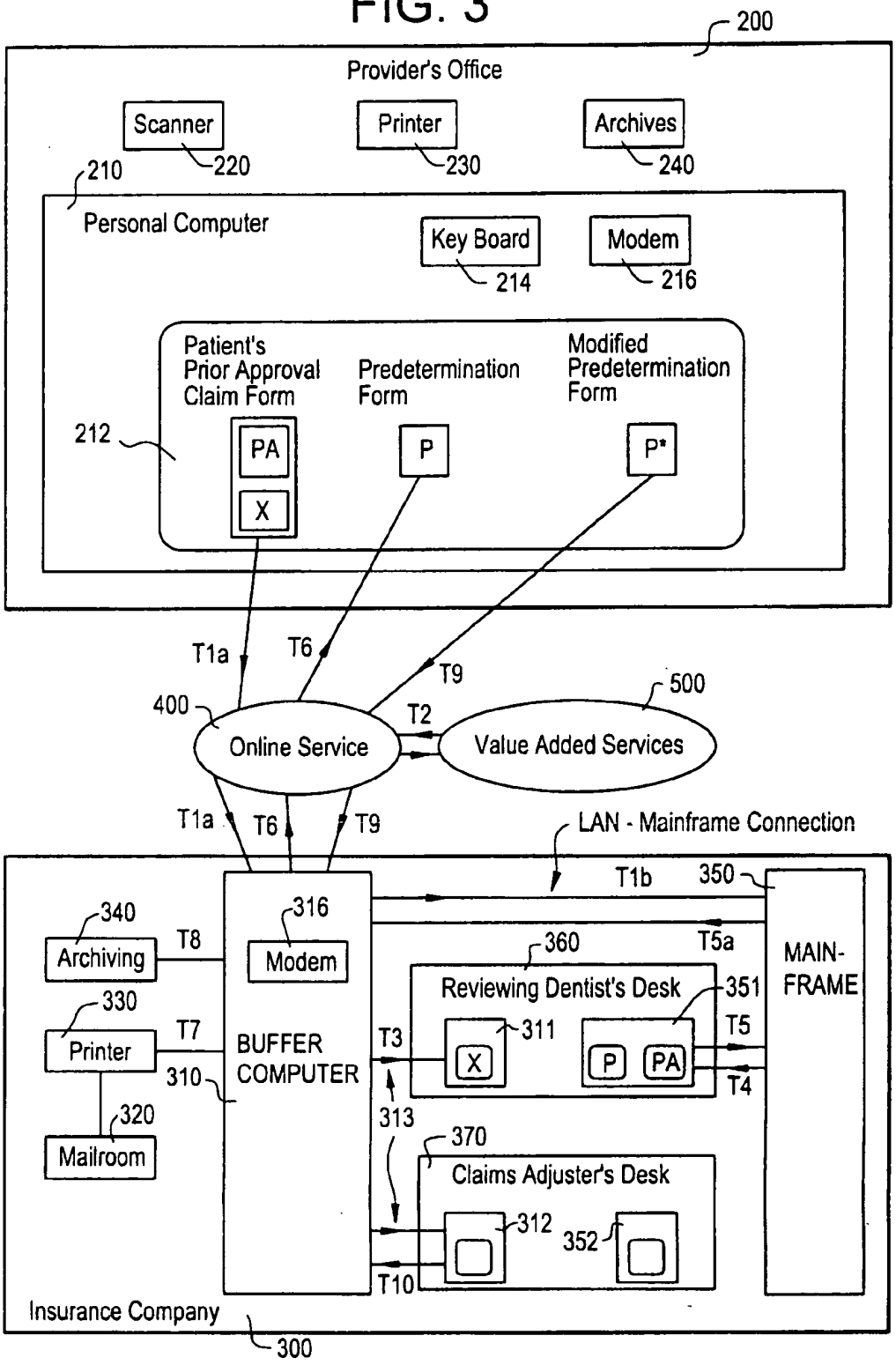

200
Provider's Office
Scanner
220
Printer
230
Archives
240
210
Personal Computer
Key Board
214
Modem
216
Patient's Prior Approval Claim Form
Predetermination Form
Modified Predetermination Form
212
PA
X
P
P*
T1a
T6
T9
400
Online Service
T2
500
Value Added Services
T1a
T6
T9
LAN - Mainframe Connection
T1b
350
340
Archiving
T8
316
Modem
360
T5a
MAIN-FRAME
Reviewing Dentist's Desk
351
330
Printer
T7
BUFFER COMPUTER
T3
311
T5
X
P
PA
T4
310
313
320
Mailroom
370
Claims Adjuster's Desk
312
352
T10
Insurance Company
300

FIG. 4

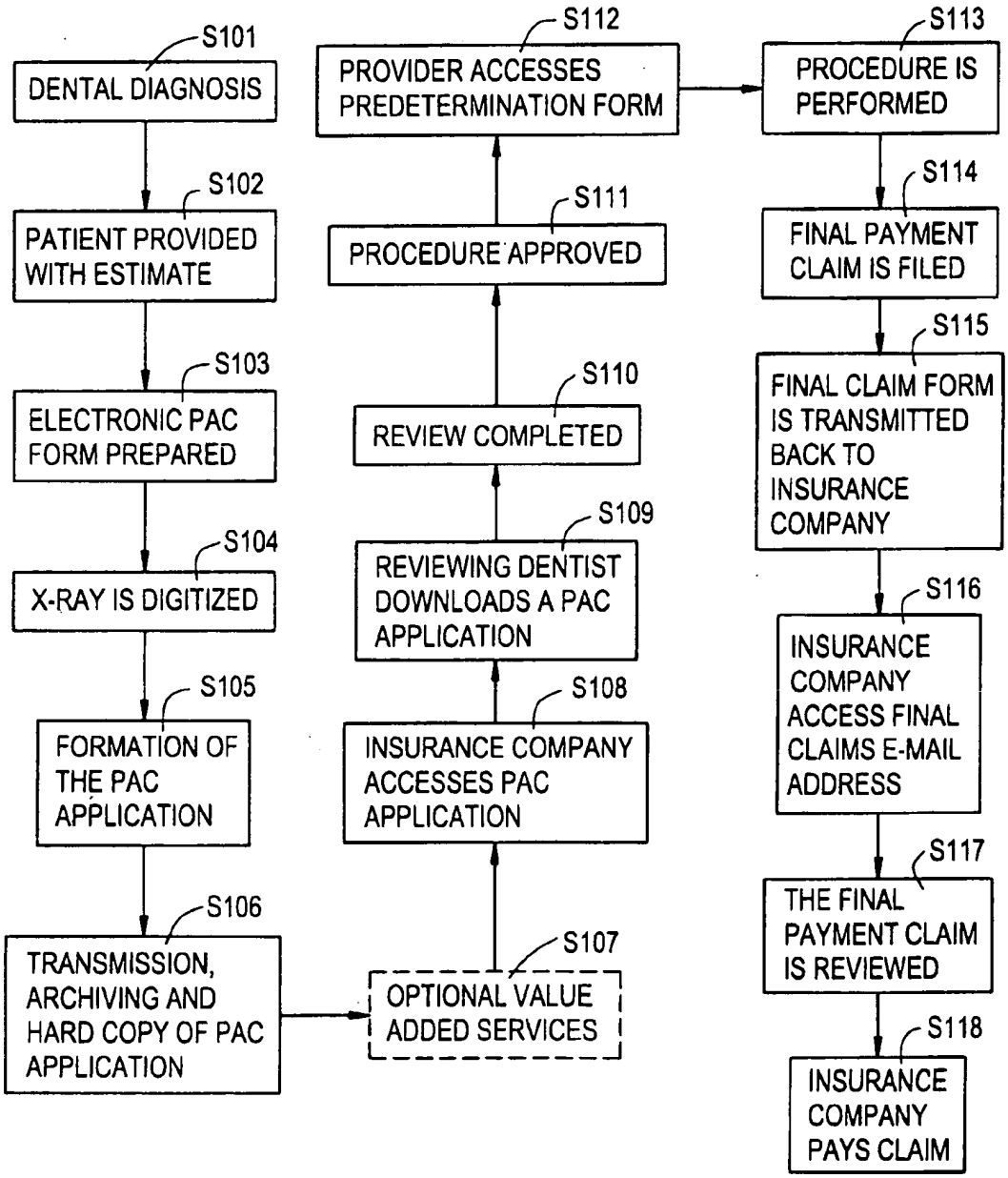

S101
DENTAL DIAGNOSIS
S102
PATIENT PROVIDED WITH ESTIMATE
S103
ELECTRONIC PAC FORM PREPARED
S104
X-RAY IS DIGITIZED
S105
FORMATION OF THE PAC APPLICATION
S106
TRANSMISSION, ARCHIVING AND HARD COPY OF PAC APPLICATION
S107
OPTIONAL VALUE ADDED SERVICES
S108
INSURANCE COMPANY ACCESSES PAC APPLICATION
S109
REVIEWING DENTIST DOWNLOADS A PAC APPLICATION
S110
REVIEW COMPLETED
S111
PROCEDURE APPROVED
S112
PROVIDER ACCESSES PREDETERMINATION FORM
S113
PROCEDURE IS PERFORMED
S114
FINAL PAYMENT CLAIM IS FILED
S115
FINAL CLAIM FORM IS TRANSMITTED BACK TO INSURANCE COMPANY
S116
INSURANCE COMPANY ACCESS FINAL CLAIMS E-MAIL ADDRESS
S117
THE FINAL PAYMENT CLAIM IS REVIEWED
S118
INSURANCE COMPANY PAYS CLAIM

FIG. 5A

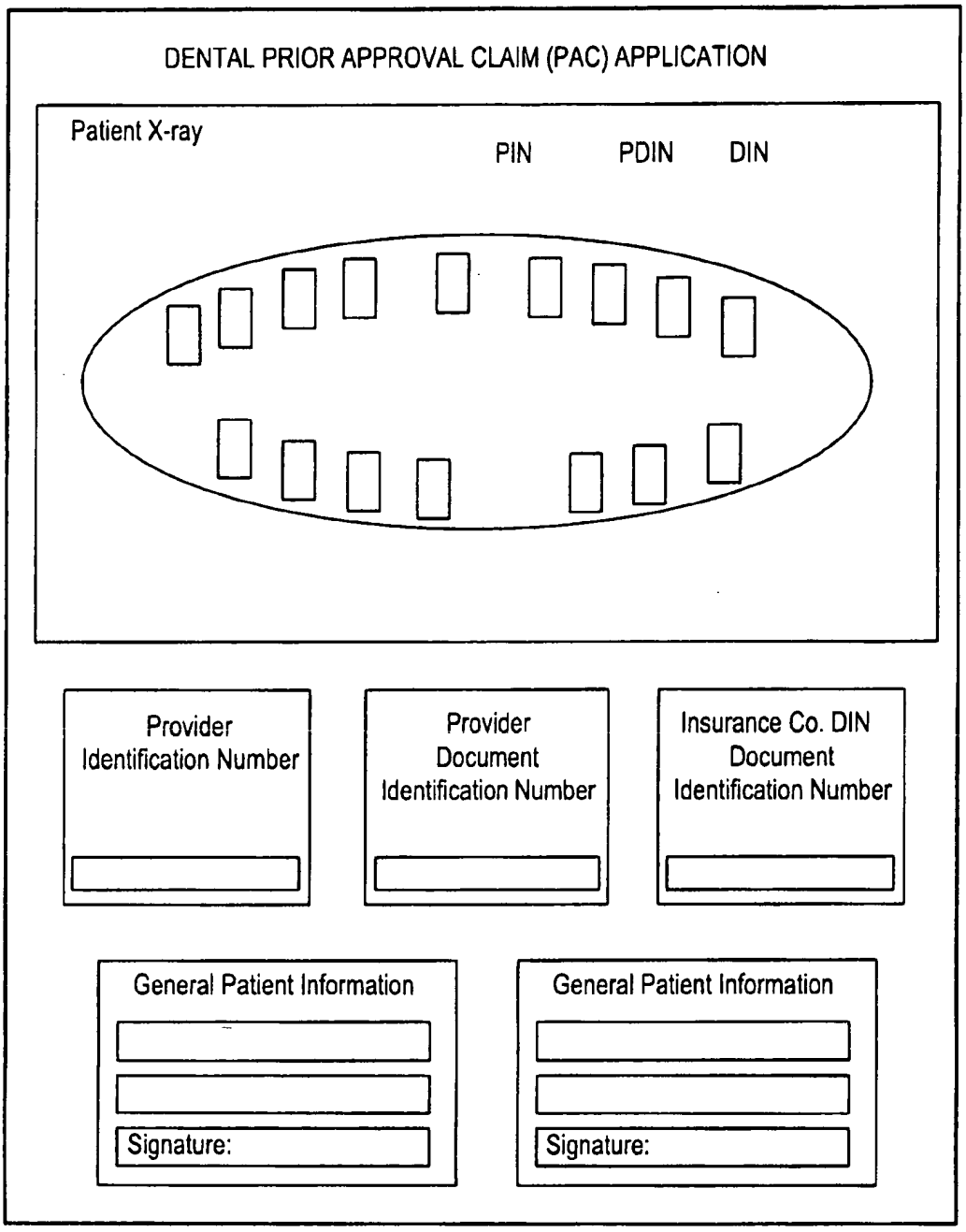

DENTAL PRIOR APPROVAL CLAIM (PAC) APPLICATION
Patient X-ray
PIN
PDIN
DIN
Provider Identification Number
Provider Document Identification Number
Insurance Co. DIN Document Identification Number
General Patient Information
Signature:
General Patient Information
Signature:

FIG. 5B

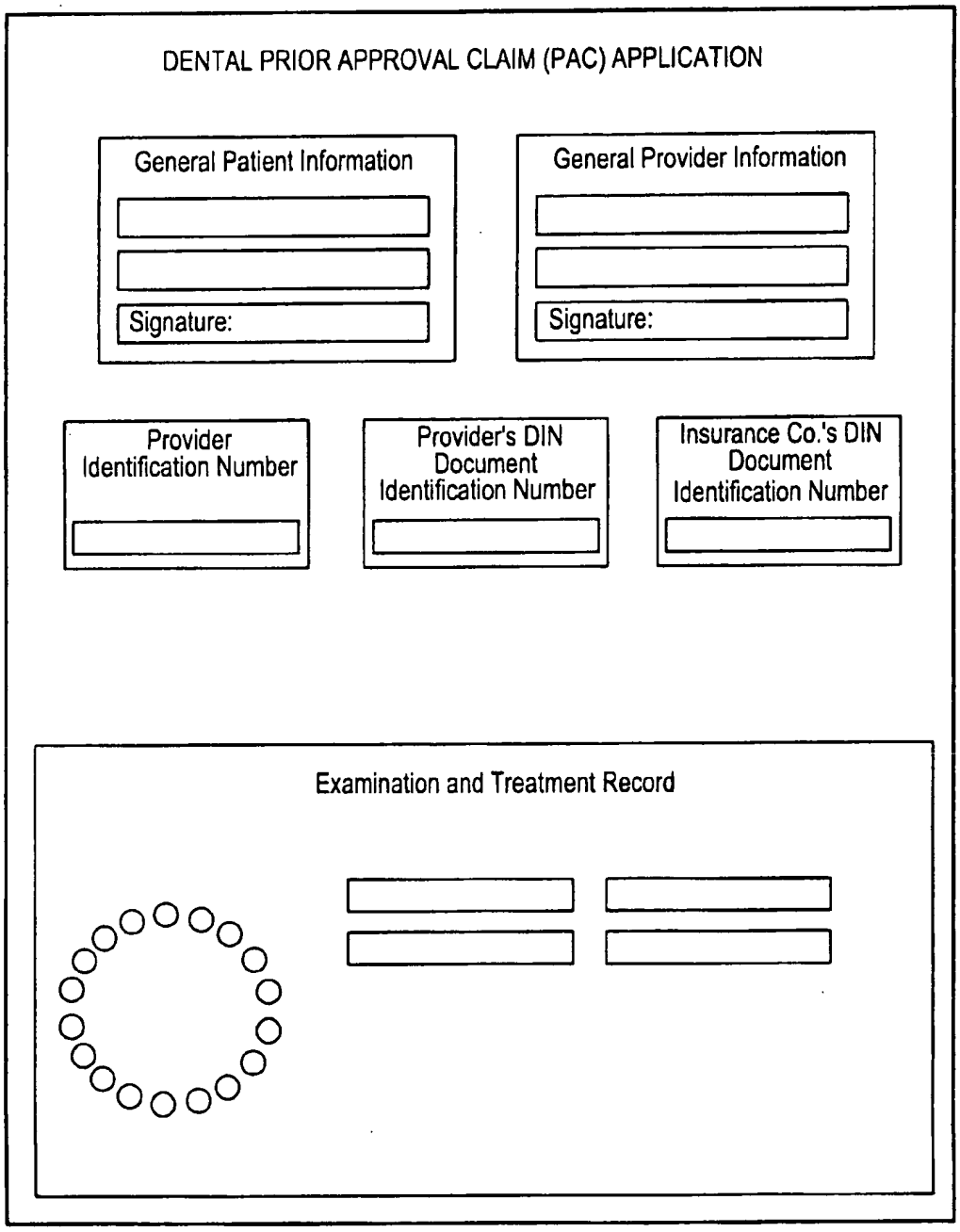

DENTAL PRIOR APPROVAL CLAIM (PAC) APPLICATION
General Patient Information
Signature:
General Provider Information
Signature:
Provider Identification Number
Provider's DIN Document Identification Number
Insurance Co.'s DIN Document Identification Number
Examination and Treatment Record

FIG. 6A

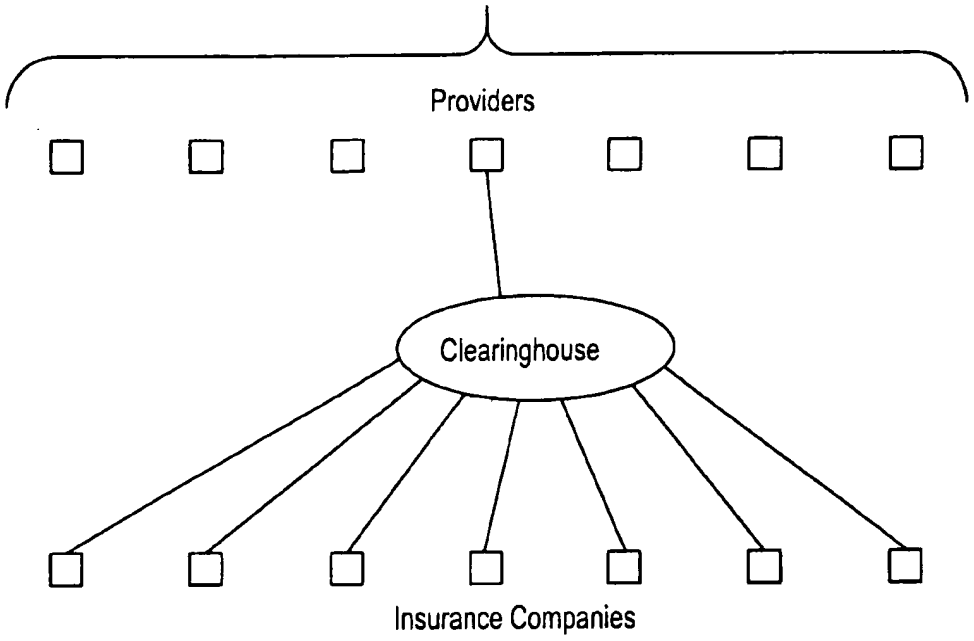
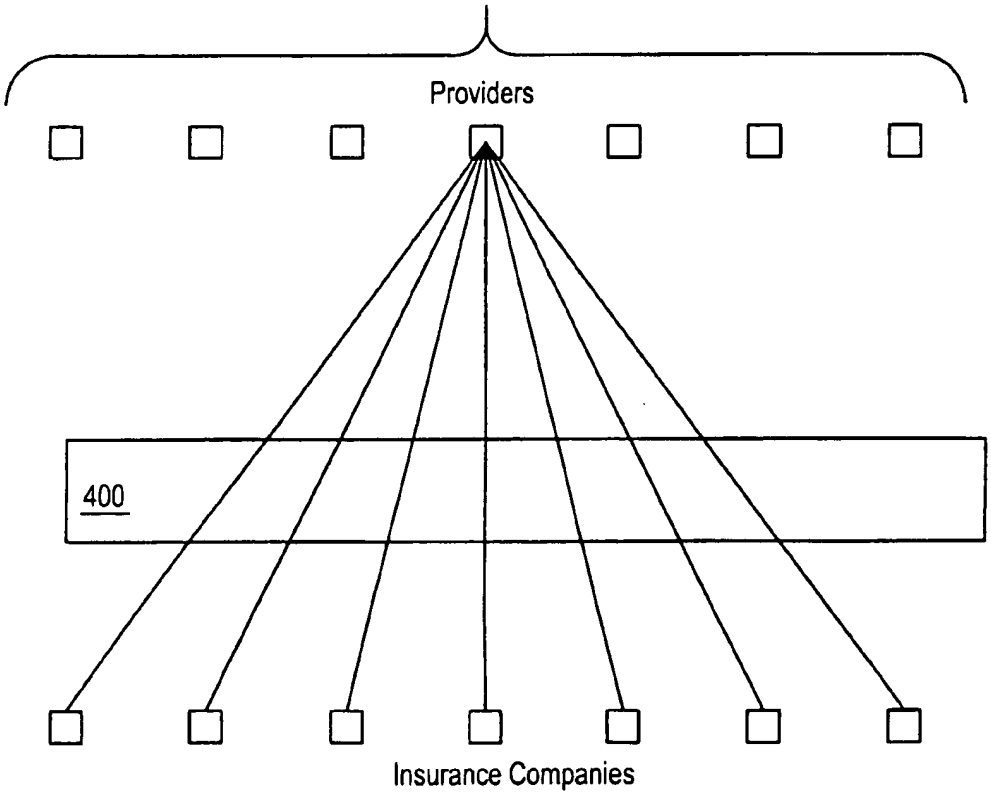

Providers
Clearinghouse
Insurance Companies

FIG. 6B


Providers
400
Insurance Companies

ATTACHMENT INTEGRATED CLAIMS SYSTEM AND OPERATING METHOD THEREFOR

This application is a con of Ser. No. 09/232,805 Jan. 19, 1999 U.S. Pat. No. 6,076,066 which is a con of Ser. No. 08/824,010 Mar. 25, 1997 U.S. Pat. No. 6,003,007 and claims benefit of Ser. No. 60/014,427 Mar. 28, 1996.

BACKGROUND OF THE INVENTION

The present invention relates generally to an attachment integrated claims (AIC) system for preparing and processing forms with integrated attachments. More specifically, the present invention relates to a Customizable Claim Form, i.e., a Dynamic Claim Form (DCF) suitable for use with an AIC system. A method of operating a totally digital AIC system while employing a DCF is also disclosed.

High administrative costs for filing and processing health insurance claims have been the bane of the health insurance industry from its inception. Over the years, many attempts have been made to develop a faster and more cost effective claims processing system. Three stages in this development effort are described in the following correspondingly numbered paragraphs.

(1) The original system involved hard copy paper claims only, with transmission and all processing done manually. Originally, an insurance claim was filed by the patient or the health care provider filling out a paper form. The completed paper form was then mailed to the insurance company. At the insurance company, the paper claim form went through a series of administrative steps, all the time remaining as a hard copy paper object. When a decision was made, the decision was written up and archived with the claim form; a hard copy was also sent to the patient and/or provider along with the payment.

(2) The first significant advancement resulted from the introduction of the mainframe computer. This allowed for electronic processing within a given insurance company, i.e., once the claim was on the computer inside the company, the paper form could be dispensed with. Computerization is a highly effective way of reducing administrative overhead in claims processing.

Thus, mainframe computers were purchased and installed internally at the insurance companies. Since these computers were intended for internal use only, each company thought only of its own needs and either developed proprietary claims processing software or had claims management software purchased from an outside source customized to meet the insurance company's claims processing methodology. While the claims management software for a number of insurance companies would be written in the same high-level programming language, e.g., COBOL, the similarity between software programs often ended there.

There were many virtues to these early systems, primarily with respect to decreased administrative costs, but a major drawback was that the data for each "paper" claim had to be entered into the computer to form an electronic claim. This necessitated the manual transcription of exactly the same information that had been entered into the original paper claim before it was sent to the insurance company.

(3) The next advancement was the electronic filing of claim forms. This was made possible by the introduction of the personal computer and modem into the provider's office. The main purpose of this stage was to eliminate the manual re-entry of information into the insurance company mainframe.

The basic idea was to have the providers fill out an electronic claim form, instead of a paper claim form. This electronic form, which would be stored in the memory of their PCs, would then be transmitted, as a computer file, to the insurance company. It could then be integrated directly into the electronic claims processing system without the manual re-entry of data. Thus, the technology existed to produce a system that computerized the overall filing and processing of the insurance claim from the point of entry, the provider's office, to the final report of the claims adjuster.

Although the idea was straightforward, implementation was not. Two basic problems had to be overcome in order to create a viable system. First, the information contained in the electronic claim form had to be integrated into the claims processing software at the insurance company. Second, a majority of providers have to be able to interface with a majority of insurance companies, i.e., insurance company mainframe computers. However, because of the way computers were introduced into the insurance industry originally (stage #2), there was no industry-wide standard, i.e., the legacy mainframe computers of the different insurance companies were incompatible. This was true both with respect to the type of software used and with respect to the information that each company required on its claim form.

One attempt to deal with these problems was the creation, by a consortium of insurance companies, of the National Electronic Information Corporation (NEIC). NEIC's basic function is that of a clearinghouse. It acts as a common interface between the insurance companies and the service providers. It also establishes rigid standards that must be met in order to transmit an electronic claim form to an insurance company. In practice, the service provider sends an electronic claim to a vendor, who performs a service such as screening of the form. The vendor then transmits the form to NEIC, which then re-transmits it to the patient's insurance company. Since it is a computer file, the information in the electronic claim form can then be entered directly into the company's mainframe claims processing system, without the manual re-entry of data, and then processed.

Thus, a coherent system was created that allows for the electronic filing, transmission, and processing of insurance claims. This system is employed by thousands of providers and hundreds of insurance companies.

NEIC was designed to act as a clearinghouse for claims that are 100% text and that conform to very restrictive formats. For claims that meet these conditions it functions well, resulting in substantial savings on administrative costs for the insurance companies. It has been estimated that going to this third stage system results in savings of as much as 60% in claims processing costs.

However, there are many claims that do not meet these conditions. These would include claims that require additional text information that does not fit into the prescribed format and/or claims that require non-text information. In general, these are called "claims with attachments." "Attachments" are any additional information that must be sent with the "standard text claim form." This could include: pictures, graphs, additional text not allowed on the standard claim form, sound recordings, etc.

An example of such a claim would be the PAC (Prior Approval Claim), which may be alternately denoted as a "Pretreatment Claim." These are claims that are sent to the insurance carrier before a procedure is performed. For example, pretreatment claims are often required by dental insurance companies on any procedure over a specified amount, e.g., $200. The aspect of this type of claim which

renders it incompatible with the present electronic claim processing system is that the insurance companies require that additional medical evidence be included, i.e., attached to, the text part of the claim form. In an exemplary case, the additional medical evidence is an x-ray.

The goal of the insurance company is to review the claim, i.e., both the text form and attachment, and to do so in a cost-effective manner. The natural next stage in the development of claims processing systems is to attempt to computerized this process.

Scanners are now available that can digitize a dental x-ray, i.e., convert it into a computer file that can be viewed on a monitor. Nevertheless, transforming the medical evidence into digital form is not enough to facilitate electronic processing of claims with attachments. One must also take into consideration the existing claims processing infrastructure, i.e., the legacy infrastructure.

The difficulty with trying to include a digitized x-ray for processing with an electronic claim form, within the current infrastructure, is multifaceted. First, NEIC does not at the present time allow this type of information to be transmitted through NEIC to the insurance companies. Second, with the current system, the claims adjusters access claims information through terminals connected to mainframes. However, there is the inherent problem of displaying images on mainframe computers. This is especially true of mainframe computers running software written in business programming languages such as COBOL. It might be thought that a solution to this problem would be to replace the terminal with a PC. Although many personal computers provide the graphics support needed to display the digitized x-ray, there are significant problems in interfacing a PC with a mainframe computer. For example, in order to interface with the mainframe computer, PCs often run terminal emulation software that permits the PC to act like a dedicated, dumb terminal attached to the mainframe computer. Terminal emulation software is notoriously lacking in graphics capability. Finally, getting a digitized x-ray from one provider to one insurance company is not all that is needed. Rather, what is really needed is an industry-wide system by which a provider can interact with any insurance company. This results in a massive interfacing problem since there are multitudes of insurance companies using different legacy hardware systems and company unique software.

Each time a way has been found to more fully utilize computers in claims processing systems, the administrative costs associated with claims processing have gone down. However, in the area of "claims with attachments," no coherent industry-wide system exists that allows for the integrated filing, transmitting and processing of these claims electronically, i.e., via computers. Thus, when attachments are required, providers are forced to submit hard copy claim applications, while insurance companies labor under an administrative system that is a hybrid between a manual and an electronic system, i.e., a hybrid between stage #1 and stage #2. This hybrid system, which is described in greater detail below, is labor intensive, prone to problems, and slow. For providers, insurance companies, and patients, this is a time-consuming, costly and irritating process.

In short, there is at least one type of insurance claim that has not, until now, been able to avail itself of the third stage of computerization, as described above. In fact, there are even difficulties with the second stage. This group includes any claim whose "standard text form" must be accompanied by additional information that does not fit into this standard format, e.g., x-rays, EKGs, additional text information such as Operating Room Reports, etc. In general, these are referred to as "attachments." One primary example of this would be Prior Approvals for dental procedures. Prior Approval Claim (PAC) applications are those claims that are submitted for the purpose of receiving a predetermination of benefits from the insurance company for a procedure that has not as yet been performed.

In the area of Prior Approval Claims, the goals of the insurance companies are to validate the necessity of the procedure and to determine whether the patient's insurance policy obligates the insurance company to pay for such a procedure. This requires that the insurance company itself review the medical evidence. For an insurance company's in-house dentist, for example, to make this appraisal, the dentist is required to review both the "text form" and the accompanying x-ray of the patient. However, the presence of a film x-ray means that electronic claims methods cannot be implemented. The savings associated with electronic claim processing is not available with respect to Prior Approval Claim forms.

Nationwide, there are approximately 200,000 dental PACs filed per week. Roughly, for every PAC application there will be eventually a Final Payment Claim (FPC) submitted when the medical procedure is completed. It is estimated that the overall administrative cost is $25 per PAC form and $10 for the Final Payment Claim. It is also estimated that if a coherent electronic system could be implemented, it would reduce these administrative costs to $15 per PAC and $5 per Final Payment Claim. The savings could amount to as much as $3,000,000 per week collectively for the health care industry for dental PACs and FPCs alone.

An example of a hybrid system of claim processing currently in use will now be described with reference to FIGS. **1**, **2A** and **2B**.

Referring first to FIG. **1**, the U.S. Postal Service, denoted as **100**, connects the service provider's office **200** with the insurance company **300**. It will be appreciated that, since PAC form handling is entirely manual at location **200**, the service provider's office is depicted as lacking computer equipment. In contrast, the insurance company typically has at least one mainframe computer **350** to which terminals **351**, **352** on the respective reviewing dentist's and claims adjuster's desks are connected. It should also be noted that the mail room **320** is charged with a variety of tasks associated with the incoming and outgoing correspondence, as discussed in greater detail below.

As will be appreciated from FIG. **1**, a paper PAC form is filled out by the patient and/or the provider and, along with the substantiating x-ray, is mailed to the patient's insurance company. Upon entering the mail room of the insurance company, the PAC form is assigned a document identification number (DIN) and the data from the PAC form is then entered into the company's mainframe computer. This same DIN is affixed to the x-ray. The x-ray is then manually delivered to the reviewing dentist.

By using the DIN on the x-ray, the reviewing dentist downloads, from the mainframe computer, the textual part of the patient's PAC application. The dentist makes a decision, records it in the memory of the mainframe computer, and has a hard copy of the Predetermination form posted back to the provider. Once the procedure has been completed, the provider's office completes the Predetermination form, or fills out a separate Final Payment Claim (FPC) form. This is then posted to the insurance company. A chronological, detailed, step-by-step description of the hybrid system will now be provided with reference to FIGS. **1**, **2A** and **2B**.

During step S1, the dentist decides that a costly procedure is necessary for a patient whose insurance carrier requires prior approval for such treatment. During step S2, the dentist provides the patient with his diagnosis and gives the patient an estimate for performing the recommended procedure. The dentist then asks the patient to contact his insurance carrier, or plan administrator at work, to obtain the necessary PAC form. During step S3, the patient completes that portion of the PAC form that pertains to him, signs the form, and sends it to his provider.

After the PAC form arrives at the provider's office at step S4, one of the office personnel retrieves the patient's file and the PAC form at step S5, extracts the patient's x-ray, either the original, a copy of the original, or a second, previously taken x-ray, during step S6, and the PAC form is filled out entirely by hand, i.e., the information about the provider has to be entered every time a new PAC form is received, during step S7. Copies of the completed form are made and are placed in the patient's file during step S8. The envelope containing the PAC form is addressed to the appropriate insurance company at step S9. The form and the x-rays are placed in the envelope during step S10. An entry is made in both the patient's computer file (if the provider's office is equipped with one) and his hard copy file indicating that the PAC form has been sent during step S11 and, finally, during step S12, the envelope is mailed. See task T1 in FIG. 1.

The envelope meanders through the U.S. Postal Service 100 for several days at step S13 until the envelope finally arrives at the mail room 320 of the insurance company 300 at step S14. In the mail room, the envelope is opened (step S15), the data from the PAC form is entered into the insurance company's mainframe computer 350 and is given a Document Identification Number (DIN) that identifies the patient and the current claim application (step S16). See task T2 in FIG. 1. During step S17, the x-ray is labeled with the same DIN. It will be appreciated that the DIN on the x-ray and in the document now on the mainframe computer must be identical. It will also be appreciated that for some insurance companies, this manual processing is contracted to an outside agency, which would require several more steps, which steps will not be described further.

During step S18, the x-ray is manually forwarded to the reviewing dentist's area. See task T3 in FIG. 1. During step S19, the PAC form is transferred to a directory and waits to be read by a reviewing dentist.

During step S20, a group of x-rays arrives from the mail room at the reviewing dentist's area. A film x-ray is pulled out of the waiting pile by the dentist during step S21 and the reviewing dentist then accesses the "PAC form" directory during step S22 by, for example, reading the DIN from the x-ray and typing the DIN into the computer. The electronic PAC form corresponding to this x-ray is located in memory and downloaded to the reviewing dentist's monitor during step S23.

The procedure requested is read off the terminal monitor and the film x-ray is reviewed during step S24 and a determination is made during step S25. It will be appreciated that a determination refers to either an approval or a denial of the request. Assuming that the procedure is approved, a statement (or explanation) of benefits (EOB) is also generated. For the purposes of this discussion, it will be assumed that the procedure is approved; a denial would necessitate a parallel but alternative set of processing steps, which steps will not be further described. During step S26, the insurance company's Predetermination form is filled out either electronically or by hand. For an electronic Predetermination form, the form is saved to the memory of the insurance company's mainframe computer during step S27. The x-ray is returned to the mail room during step S28. See task T4 in FIG. 1.

Following approval, a paper copy of the Predetermination form is made during step S29. See task T5 in FIG. 1. An envelope is then addressed to the referring dentist and the Predetermination form is placed in the envelope during step S30. During step S31, the corresponding x-ray is matched with the Predetermination form and, during step S32, the corresponding x-rays are placed in the envelope. The envelope then goes back into the U.S. Postal System 100 during step S33. See task T6 in FIG. 1.

Some days later, the envelope finally arrives at the dentist's office 200 and is opened during step S34. The results are noted in both the patient's paper file and computer file during step S35, the x-rays are returned to the patient's paper file at step S36, and the patient is notified of the approval and a date is set for performing the approved treatment during step S37.

The treatment is completed during step S38 and the Final Payment Claim (FPC) form is filled out during step S39. It will be appreciated that the Final Payment Claim form, for many but not all insurance companies, is merely a subsection of the Predetermination form generated in step S29 (See the paper denoted P* in FIG. 1.); alternatively, the Final Payment Claim form could be yet another form supplied by the insurance company.

The Final Payment Claim form is then sent back to the insurance company with a copy of the signed Predetermination form during step S40. See task T7 in FIG. 1. The Final Payment Claim form enters the mail room as a paper form and the final processing begins during step S41. It will be appreciated that the processing of the Final Claim Form typically requires making several entries in the information stored on the mainframe computer 350 and may require the preparation of one or more forms needed to authorize payment of the final claim. However, since an attachment is not normally associated with the Final Claim Form, additional discussion regarding disposition of the Final Claim Form within the insurance company will not be provided.

Thus, the hybrid system under discussion is one that starts in the provider's office when a patient is told that a PAC form is needed and continues until the procedure has been completed and a Final Payment Claim form has been submitted to the insurance company for payment. It will be appreciated that a myriad of problems and inefficiencies arise due to claim processing in accordance with the hybrid system. The principal problems are as follows:

1. All information needed to complete the PAC form has to be entered by hand. Moreover, all of the information on the PAC form is also manually transcribed in order to transfer the information from paper to the insurance company's mainframe computer. Both of these manual data entry process steps are time consuming, very costly, and prone to human error;

2. The x-ray film and the text form are put together and then separated several times during the overall claim processing;

3. The hybrid system requires that a hard copy of the x-ray be sent to the insurance company. Generally, this x-ray is returned to the provider. Moreover, the requirement that the dentist provide the x-ray typically means that a duplicate x-ray has to be made by the dentist, which increases the dentist's cost for the service. Oftentimes, the duplicate x-ray is of poor quality and cannot be read;

4. Because prior approval claim forms cannot be processed electronically, and because PAC forms make up half of all the claims that approximately 20,000 oral surgeons, periodontists, and orthodontists make each year, these 20,000 providers have no compelling reason to initiate electronic claims or Final Payment Claims;

5. The document identification number is affixed to the x-ray and the electronic text in two different processes, one physical and the other electronic. This leads to errors;

6. After the procedure has been completed, almost identical information may again have to be entered by hand in order to prepare the Final Payment Claim form;

7. While direct digital x-ray equipment is available, it is difficult to integrate a digital x-ray into the current hybrid claims processing system, i.e., these computerized images would first have to be transferred to film, which would, of course, negate the major advantage for using direct digital x-rays;

8. Some insurance companies would like to require that x-rays accompany all dental claims; they are prevented from doing so because of the high administrative overhead associated with handling hardcopy claims;

9. The patient has to obtain the PAC form from the insurance company or his employer. In either case, this causes the patient time, is an irritant, and imposes unnecessary delays on the delivery of medical care to the insured;

10. With the hybrid system, no pre-screening of the PAC form for errors is performed before the PAC form goes to the insurance company; and

11. Provider information, i.e., the dentist's information, often has to be entered separately on each new PAC form that is submitted.

In short, the current method for handling PAC applications is a hybrid system somewhere between a Stage 1, a totally paper-based manual processing system, and a Stage 2 internally computerized insurance company processing system. It is part electronic and part hard copy. Also, each form must be handled twice, once as a hard copy and once as an electronic copy. This is the source of a great many of the above described problems. Moreover, the current hybrid method is costly. The process starting at the provider's office, continuing through the insurance company and finally to the return of the Predetermination form to the provider has been estimated to cost $25. Furthermore, the whole process is filled with potential for error, frustration, wasted time and money.

The workflow for the filing and processing of a PAC form was described above with respect to the dental health insurance which was used, by way of example, to illustrate the circuitous process involved when a hard copy attachment is present. Other types of claims, or attachments, or different insurance companies might require slightly different steps. For example, instead of returning an attachment, as describe above, the attachment might need to be microfilmed and archived, or some of the information contained in the attachment itself might need to be entered into the mainframe. Regardless of these differences, there are similarities in the problems that arise in processing such claims.

In summary, in the insurance industry, payers and providers exchange a great amount of information, which, in general, falls into two categories:

1. Information flowing from the Payer to the Provider. It will be appreciated that this information can be further subdivided into additional types of information including, but not limited to information directly related to the Claim Application, e.g., content of the claim form or list of specified attachments needed to support a particular CPT code, general information, e.g., Preferred Provider List for specialists, etc., and responses to submitted claims, e.g., RFI on a claim sent.

2. Information flowing from the Provided to the Payer. It will be appreciated that this information will generally be limited to Completed Claim Applications, e.g., AIC forms.

It will be appreciated that the information specified by the payer as item (1) determines the information provided by the provider in item (2). It will also be appreciated that this information flow is further complicated by the fact that each of the various payers may have:

1. Differing Claims Information Requirements, i.e., the information each payer requires is unique to that specific payer;

2. Differing General Information, i.e., each payer has a respective unique set of preferred providers;

3. Dynamic Information Demands, i.e., the information identified immediately above changes over time; and

4. Different legacy system requirements, i.e., the provider generates a plurality of AIC forms, each going to a different payer in a payer specified format.

As discussed above, the information flowing from the provider to the payer can be in one of several forms, including:

1. Paper Claim Forms—These forms tend to have different content and to have the blanks for content arranged differently on the page. This leads to confusion and wasted time at the provider's office in completing the forms.

2. Electronic Claim Forms—Because of the differing legacy computer systems and because of the confusion created by different forms, the current electronic solution takes the form of a rigid standardized electronic form based on truncated information. Stated another way, in order to optimize the cost savings of electronic forms, the payers are bound together in a rigid group where all must accept the limited information of a standardized electronic form and none can act independently to request more information be sent electronically.

3. General Information—Information regarding preferred providers, etc., is currently available in hardcopy form. It will be appreciated that one hardcopy Preferred Provider List is very time consuming to use; the problem is exacerbated when many Preferred Provider Lists must be maintained. Even when this information is in digital form, there are still problems for providers because each payer has its own database and ways of searching for information within that database.

What is needed is an electronic claim form instantiated by a Standard User Interface (SUI) which allows each provider to complete and then electronically transmit claim forms, which differ from one payer to another, to all payers. What is also needed is a dynamic claim form which permits each payer the freedom to independently determine the information content of its electronic claim form and to change that information, at will, over time. It will be appreciated that this latter requirement could be provide while, at the same time, maintaining the single multi-payer solution including the SUI. Thus, each payer can specify and later modify the information that it wants from all providers, while each of the providers always see and fill in the same form. What is also needed is a dynamic claim form which allows an individual payer to be readily selected by the provider. It would also be desirable if the dynamic claim form could

assist the provider in determining the information required by the selected payer. It will be appreciated that the enumerated desirable characteristics permits overall system coherence (interoperability) yet independence for each payer.

SUMMARY OF THE INVENTION

One purpose of the present invention is to create a coherent system that allows for the electronic filing, transmission, and processing of "insurance claims with attachments," and to thereby overcome the many deficiencies of the hybrid system claims processing methodology described above.

Thus, one object according to the present invention is to provide a PAC form processing system which minimizes the necessity of manual data entry. According to one aspect of the present invention, only about 40% of the information needed to complete the PAC form has to be entered by hand. According to another aspect of the present invention, the amount of information that has to be manually re-entered by an operator is essentially zero.

Another object according to the present invention is to provide a PAC application processing system which eliminates handling errors resulting in a mismatch between, for example, a PAC form and an associated patient x-ray. According to another aspect of the invention, mismatch errors are virtually eliminated since the electronic x-ray and the associated text are never separated; field data included in, for example, the PAC form is copied and transferred between the server and the mainframe computer systems inside the insurance company. According to yet another aspect of the invention, mismatch errors are virtually eliminated since no hard copy of the x-ray is ever sent to the insurance carrier.

Still another object according to the present invention is to provide a PAC application processing system which increases the number of service providers employing electronic claims systems to thereby reduce the overall claims processing costs. Since a PAC form can now be handled electronically in accordance with the present invention, electronic final payment claims become viable for approximately 20,000 additional dentists.

A still further object according to the present invention is to provide a PAC application processing system in which Document Identification Numbers, or some other method of uniquely specifying the PAC, are simultaneously associated with both the text and the x-ray by a single computer entry.

Yet another object according to the present invention is to provide a PAC application processing system which operates at lower cost. Cost efficiencies are readily achieved according to the present invention by eliminating the need to send a physical x-ray with the claim.

Another object according to the present invention is to provide a cost effective claim processing system wherein little or no information on either the PAC form or the Predetermination form has to be manually re-entered.

Still another object according to the present invention is to provide a totally digital PAC application processing system which can accommodate both text and digitized x-rays at low cost, thereby allowing insurance companies to require x-rays with all claims because such requirements will not significantly increase the processing cost associated with non-x-ray documented claims.

An additional object according to the present invention is to provide a totally digital PAC application processing system in which a dynamic claim form, i.e., the PAC form, which addresses the needs of all insurance carriers, is stored in the memory of the computer in every service provider's office. Alternatively, this form could also be stored and accessed at an Internet website. This, in combination with a non-clearinghouse communications channel and having AIC system software at all of the insurance carriers, then eliminates the need for imposing industry-wide standards, such as ANSI ASC X12, for claim-related electronic transactions. The present invention allows each individual insurance company to obtain the information that it requires and to get that information in whatever format that insurance company prefers. Moreover, the ability to transmit the dynamic claim form and integrated attachment to an insurance carrier via a non-clearing house communications channel advantageously permits the transmission of other types of claims, including worker's compensation claims, to the insurance carrier. In addition, it will eliminate the irritant of the patient or provider having to obtain a PAC form from a particular insurance company. Finally, it will give the provider "time of service notification" of the needs of the payer. This, in turn, will drastically reduce the rate of claim rejection by the payer with the attendant necessity of re-review of a claim by the provider.

Another object according to the present invention is to provide a totally digital PAC application processing system in which pre-screening of information entered into a PAC form, which is stored in the memory of the computer in the service provider's office, is easily performed.

Yet another object according to the present invention is to provide a totally digital PAC application processing system in which provider information is automatically entered into each PAC form.

It will be appreciated that none of the above-identified objects need actually be present in invention defined by the appended claims. In other words, only certain, and not all, objects of the invention have been specifically described above. Numerous other objects advantageously may be provided by the invention, as defined in the appended claims, without departing from the spirit and scope of the invention.

These and other objects, features and advantages according to the present invention are provided by a standard graphical user interface (GUI) instantiated by computer software for generating a file from text data entered into selected ones of N fields in the GUI, wherein the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields, and wherein N is an integer greater than 2. Moreover, the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields. In an exemplary case, the first predetermined one of the N fields accepts a payer name while the second predetermined one of the N fields accepts a CPT code.

According to another aspect, the present invention provides combination of storage media storing computer readable instructions for permitting non-networked computers to cooperate synergistically including a first storage medium storing computer readable instructions for permitting a first computer system to generate a form including N fields, to receive textual data as field data in selected ones of the N fields, to assemble the field data and a corresponding digitized attachment into a first file, and to transmit the first file to a second computer system via a communications channel, a second storage medium storing computer readable instructions for permitting the second computer system to receive

the first file via the communications channel, to display the corresponding digitized attachment on a second screen of the second computer system, and to transfer the field data to a third computer operatively connected to the second computer, and a third storage medium storing computer readable instructions for permitting the third computer system to receive the field data from the second computer, to display the field data on a third screen of the third computer system and to generate a second file including portions of the field data extracted from the first file. Preferably, the selected ones of the N fields accepts text data are determined responsive to text entered into a first predetermined one of the N fields, and N is an integer greater than 2.

According to yet another aspect, the present invention provides a method for operating a computer system including first, second and third computers, each of the first, second and third computers including a memory, an input device, and a display, respectively, the first and the second computers being connected to one another by modems and a common communication line, and the first computer including a digitizing device. The method advantageously includes steps for:

(a) retrieving a first form including N fields from storage in the first computer's memory and displaying the first form on the first computer's display;

(b) selecting M of the N fields responsive to text entry into a first predetermined of the N fields;

(c) writing first field data to the first form using the first computer's input device;

(d) digitizing a patient's x-ray to thereby generate a digitized x-ray;

(e) combining the digitized x-ray and the first form so as to generate an attachment integrated file;

(f) transmitting the attachment integrated file to the second computer;

(g) transmitting the first field data from the second computer to the third computer;

(h) generating a second form upon receipt of the attachment integrated file, the first and second forms containing at least a portion of the first field data;

(i) displaying the first form, the second form and an image corresponding to the digitized x-ray on respective displays of the third computer and the second computer;

(j) writing second field data to the second form using the third computer's input device;

(k) transmitting the first and second field data corresponding to second form back to the first computer,

wherein M and N are both integers greater than 2.

According to a still further aspect, the present invention provides a combination of storage media which store computer readable instructions for permitting Mx(NxR) non-networked computers to form a coherent system, including M first storage medium storing computer readable instructions for permitting each of M first computer systems to receive textual data as field data, to assemble the field data and a corresponding digitized attachment into a first file and to transmit the first file to a selected second computer system and a selected third computer system via at least one communications channel, N second storage medium storing computer readable instructions for permitting the selected second computer system of N second computer systems to receive the first file via the at least one communications channel, and to display the corresponding digitized attachment on a second screen of the selected second computer system, and R third storage medium storing computer readable instructions for permitting the selected third computer system of R third computer systems to receive the field data of the first file via the at least one communications channel, and to display the field data on a third screen of the selected third computer system. Preferably, M, N, and R are each a positive integer greater than one, the selected second computer system and the selected third computer are selected by one of the M first computer systems responsive to address information included in the field data in the first file, and multiple items in the field data is selected by diagnostic code included in the field data.

According to another aspect, the present invention encompasses a graphical user interface (GUI) instantiated by computer software for generating a file transmittable to a selected one of M recipients from text data entered into selected ones of N fields in the GUI, wherein the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields, the computer software is updated as the respective file requirements of the M recipients change, and N is an integer greater than 2.

According to a further aspect, the invention provides a graphical user interface (GUI) instantiated by computer software for generating a file transmittable to a selected one of M recipients from text data entered into selected ones of N fields in the GUI, wherein the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields, the format of the file is determined responsive to text entered in the first predetermined one of the N fields, and N is an integer greater than 2.

According to a still further aspect, the present invention encompasses a coherent computer system providing interoperability between a plurality of independent computers. Preferably, the computer system includes a plurality of first computers, each of the first computers comprising a first storage medium storing computer readable instructions for permitting the respective first computer to:

generate a form including N fields;

receive textual data as field data in selected ones of the N fields;

assemble said field data into a first file; and

transmit the first file to a selected one of a plurality of second computers via a communications channel; and

the second computers, each of the second computers comprising a second storage medium storing computer readable instructions for permitting the respective second computer to:

receive said first file via the communications channel, and

display said field data on a screen of the respective second computer.

Advantageously, in the coherent computer system, the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields,

the selected one of the respective second computers is selected responsive to the text entered into the first predetermined one of the N fields, the computer readable instructions stored on the first computers are updated responsive to changes to the selected ones of the N fields generated by a respective one of the second computers, and N is an integer greater than 2.

According to yet another aspect, the present invention provides an electronic claim form instantiated by a Graphical User Interface (GUI) which permits each of a plurality of

first users to complete and then electronically transmit N forms to N respective second users, wherein each of the N forms differs from the remaining N forms in terms of one of content and format.

According to still another aspect, the present invention provides a dynamic electronic form which permits each of a plurality of first users to: independently determine the information content of its respective electronic form, and freely change the information over time. Preferably, the electronic form presented to each of a plurality of second users is constant, irrespective of changes to the information content dictated by a respective one of the first users.

According to another aspect, the present invention provides a dynamic electronic form accessible via a computer which provides a first user with the ability to freely select a second user from a plurality of second users, and which assists the first user in determining, assembling, and transmitting information specifically required by the second user, wherein the dynamic electronic form maintains a constant appearance irrespective of changes to required information established by any of the second users.

These and other objects, features and advantages of the invention are disclosed in or will be apparent from the following description of preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments are described with reference to the drawings in which like elements are denoted by like or similar numbers and in which:

FIG. **1** is a combination high level block diagram and flow diagram which is useful in understanding the operation and attendant problems of the current hybrid system for Prior Approval Claim form processing;

FIGS. **2**A and **2**B collectively form a flow chart which illustrates in greater detail the steps needed to implement the hybrid system of FIG. **1**;

FIG. **3** is a combination high level block diagram and flow diagram which is useful in understanding the operation and system of Prior Approval Claim form processing according to a preferred embodiment of the present invention;

FIG. **4** is a detailed flow chart of the operational steps needed to operate the system illustrated in FIG. **3**;

FIGS. **5**A and **5**B illustrate alternative embodiments of the attachment integrated claim application according to two of the preferred embodiments of the present invention; and

FIGS. **6**A and **6**B illustrate clearinghouse and non-clearinghouse networks, respectively, connecting service providers and insurance companies.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a system and corresponding method implemented by software loaded onto the system for processing textual messages which are integrated with one or more attachments. Heretofore, such attachments could not be readily and/or usefully incorporated with the textual message. Hereinafter, the term Attachment Integrated Claim (AIC) Application will be used to denote a claim application including a text portion and a digital attachment portion. An exemplary embodiment of the present invention combines a patient's digitized x-rays with an electronic insurance claim form to create an electronic Prior Approval Claim (PAC) Application. Another preferred embodiment of the present invention is a coherent industry-wide system for the electronic filing and processing of these PAC Applications.

It should be noted that the term "digital attachment" as used hereinafter is not limited to a digitized image or x-ray. The term "digital attachment" is understood to embrace x-rays, CTS, MIS, EKG or EEG recordings, i.e., strip charts, digitized video signals such as Moving Picture Experts Group (MPEG) compressed video signals, transcriptions of Operating Room Notes, estimates for repairs to a house or car, Explanation of Benefits (EOB), additional ASCII text, and the like. Moreover, all particulars regarding a specific "attachment," such as medical specialty, acquiring modality, the patient's problem, etc., are to be ignored, since such details have absolutely no bearing on the various embodiments of the present invention. The only requirements regarding digital attachments are that the information must be something that can be digitized, i.e., put into the form of a computer file, and that once in this form, it can be "read, reviewed or interpreted" by the person or organization receiving it.

The preferred embodiments according to the present invention will now be described with reference to FIGS. **3** and **4**. In particular, as shown in FIG. **3**, the overall system according to the present invention includes the computer components **200** located in the health care provider's office and the computer components **300** located on the premises of the insurance company. Infrastructure **400**, which advantageously may be an existing on-line service company, is preferably used in the exemplary embodiment of the present invention to facilitate communication between the components **200** in the service provider's office and the components **300** at the insurance company. Preferably, components **500**, which are located at a value-added service company, permit services ordered by the service provider, patient, or insurance company to be performed. It should be noted that the components **500** may duplicate a subset of the components **300** found at the insurance company and, for that reason, description of the components **300** alone will be provided below.

It should also be mentioned that the description which follows describes the invention as it is used in connection with dental insurance forms. However, the present invention is not limited to systems for the processing of dental insurance claims. Rather, the present invention encompasses the preparation, transmission and processing of data packages including a plurality of data fields wherein at least one of the data fields is a digital attachment, e.g., a digital image. For example, casualty insurance claims with supporting documentation, i.e., pictures taken with a digital camera, are within the scope of the present invention. In short, the present invention is advantageous in virtually all types of electronic data interchange (EDI) transactions.

As shown in FIG. **3**, the components **200** include a personal computer **210** including a screen **212**, a keyboard **214** and a modem **216**, connected to a scanner **220**, a printer **230** and an archiving device **240**, e.g., a large memory for storage of digital information. Device **240** advantageously may be a writeable compact disc read only memory (CD-ROM), i.e., a so-called write once—read many (WORM) device, a hard disk drive, a tape back up device or a removable hard disk device. It should be recognized that the computer **210** advantageously can be a computer system including a central processing unit, a graphic display processor, the graphic display device **212**, and several memories including both solid state memories and a hard disk drive. It should also be noted that the archive device **240** and one of the memories associated with computer **210** may be the same memory device.

Components **300** located at the insurance company include the previously described mainframe or legacy com-

puter **350** and associated terminals **351**, **352**. In addition, a buffer computer **310**, which may be a network server, includes a modem **316** and is connected to a printer **330** and a storage device **340**. The printer **320** may provide copies of documents directly to the mailroom **320**. Preferably, the computer **310** is connected to personal computers or work station terminals **311**, **312** via a local area network (LAN) **313**. The buffer computer **310** and the mainframe computer **350** are electronically connected to one another. The details of such a connection are well known to one of ordinary skill in the art and will not be described in greater detail.

Before presenting a detailed description of other preferred embodiments according to the present invention, a brief overview of the operating method steps associated with formation, transmission and processing of the PAC Application will now be presented. In an exemplary and non-limiting case, the essential steps of the operating method include a first subroutine for completing and transmitting needed information to a designated insurance company. This subroutine includes steps for:

(1) Retrieving the electronic PAC form, e.g., the dynamic claim form (DCF), from storage in the computer's memory (or, in another exemplary case, from a website) and displaying the PAC form on the computer screen;

(2) Filling out of PAC form on the computer screen;

(3) Digitizing, e.g., scanning, the patient's x-ray;

(4) Combining the digitized x-ray and the electronic PAC form into the patient's PAC application; and

(5) Transmitting the patient's PAC application to the designated insurance company.

After the PAC application is received by the insurance company, the insurance company performs another subroutine, which includes steps for:

(6) Reviewing the PAC application;

(7) Generating an electronic Predetermination form when the application has been reviewed; and

(8) Transmitting the electronic Predetermination form back to the insured's Service Provider.

When the electronic Predetermination form from the insurance company is received by the service provider, an additional subroutine is performed by the service provider. This subroutine advantageously includes steps for:

(9) Reading the electronic Predetermination form;

(10) When the approved procedure has been performed, adding completion data to the electronic Predetermination form; and

(11) Transmitting the annotated electronic Predetermination form back to the Insurance Company.

When the annotated electronic Predetermination form is received from the service provider, the insurance company performs a final subroutine, which includes steps for:

(12) Reviewing the annotated information; and

(13) Issuing the final payment to the service provider.

The method for operating the system according to a preferred embodiment of the present invention will now be described in detail.

The method starts at step **S101** with the service provider's diagnosis that a costly procedure is necessary. It is then determined that the patient needs prior approval from his insurance company. During step **S102**, the patient is provided with an explanation of the procedure and a cost estimate for that procedure. The service provider and the patient then prepare the needed PAC Application.

During step **S103**, a member of the service provider's office staff accesses the Attachment Integrated Claims (AIC) software stored in non-volatile memory on the service provider's computer system **210**, which software advantageously is Graphic User Interface (GUI) software. Preferably, this AIC software is written in C++, Visual Basic, or some other appropriate graphical programming language.

It will be appreciated that commercial software packages, such as LOTUS NOTES™, have been designed with the capability of addressing combinations of text and graphics files. However, the purpose of these packages is to create an "environment" or "platform" in which specific applications can be developed. In contrast, the preferred embodiments according to the present invention are directed at providing integrated text and graphics files within a coherent system and methodology for addressing the specific needs of the work flow, preferably of a particular industry. That is, it is a particular application. It is possible, but not necessary, that the software needed to implement the preferred embodiments of the present invention can be developed within the frame work of the environment created by something such as LOTUS NOTES™. Alternatively, the software needed to implement the preferred embodiments of the present invention can be developed using either JAVA™ applets or standard graphics markup language (SGML).

Contained within the AIC software are PAC forms for insurance companies using the AIC system. When one of these is opened it acts as a template upon which a new computer file will be based. This computer file will ultimately contain the patient's PAC Application.

It will be appreciated that the PAC form when displayed on the computer's screen **212** contains boxes, such as those depicted in FIGS. **5A** and **5B**, in which alpha-numeric characters can be entered so that, when the characters are entered in these boxes they are entered so as to fill a "field," a delimited alpha-numeric character string. Being a "field," the information denoted by the characters can be transferred to and used in completing other fields in related documents. Also, the information itself, or lack thereof, can be used as a logic control device, e.g., used to remind the preparer that critical information has not been entered.

In the exemplary case being discussed, the PAC forms of many insurance companies have been encoded and stored in memory on the service provider's computer system **210**. This can be advantageously done in the following way. The PAC forms for all the insurance companies using the AIC System are gathered. Then a union of all the information requested in these PAC forms is made. A field is created for each element of information requested. For example, Field #1 contains the patient's first name, Field #2 contains the patient's last name, and so on. This is done until the "information fields" of the PAC forms for all of the insurance companies are included.

In order to increase the efficiency of the clerical staff at the provider's office, it is desirable to give them basically the same form to fill out every time, i.e., information is always in the same place on the form. To do this a template is created. What actually appears on the screen of the preparer is always the same. What changes is that any given insurance company will desire only a particular subset of the total number of fields. So if insurance company A is chosen, then fields 1,2,3,7,9, . . . have to be filled in, whereas, if insurance company B is chosen, then fields 2,3,4,5,7,11, . . . have to be filled in. The fields not needed are automatically signified in some way by the AIC software, e.g., if insurance company A does not need Field #4 then that block on the screen is gray and can't be typed into (i.e., is "write protected"). Thus a "customized claim form" is provided for every insurance

company based on a single, universal compilation of fields. As described below, what allows this method to work is that there is AIC software at the insurance company that has been coordinated with the AIC software at the providers office.

The AIC Software GUI asks for the name of the insurance company, which can be typed in or selected from a directory. Once the insurance company has been identified, the fields needed to complete the insurance company's PAC form are displayed on the screen **212** of the service provider's computer system **210**. The AIC software advantageously can automatically fill in all the parts of the form that are specific to the service provider, e.g., name, address, Provider Identification Number (PIN), etc. It is estimated that this alone eliminates 20% of the work needed to fill out the PAC form. An electronic signature could advantageously be added at this time for the service provider or could be added as part of the final review and approval before the completed PAC application is transmitted.

Needed patient information is then entered into the PAC form on the computer screen **212**, preferably while the patient is still in the office, and a provider Document Identification Number (PDIN) can be used to label the form, if so desired. This is now a computer file identified as referring to the patient. It should be noted that some form of signature can be provided in the appropriate field. As an example, a special electronic pad and pen can be used such that when the patient signs on the pad his signature is affixed to the electronic PAC form.

It will be appreciated that, for example, the patient identification number (patient ID) from the service providers own data base advantageously can be used to access patient specific information that the AIC software can insert into the PAC form, i.e., the DCF. Moreover, it will also be appreciated that the CPT code for a procedure could be keyed in to further differentiate the DCF. For example, if the CPT code is associated with the requirement for an X-ray by a particular payer, the DCF will identify the need for an X-ray attachment to the service provider. Moreover, the CPT code advantageously can be employed to further differentiate the DCF to, by way of a non-limiting example, provide a list of Preferred Providers that the particular payer has pre-approved for service providers wishing or needing to refer the CPT code-identified procedure to a specialist.

During step **S104**, the patient's x-ray is digitized. In an exemplary case, there is a scanner **220**, i.e., digitizer, connected to the service provider's computer system running the AIC software. The patient's x-ray is scanned and converted into a series of ordered numbers (i.e., a bit map of the x-ray image) and stored. It should be noted that these stored series of numbers can be reconstructed by the computer system to display the x-ray on a computer monitor, i.e., the bit map can be used to reconstruct a raster image of the x-ray for display.

It will be appreciated that the AIC software advantageously can be written to minimize the time needed to scan the x-ray. In an exemplary case, the operator can specify the type of x-ray or x-rays that are being scanned. This is done so that blank areas are not being digitized and added to the patient's file. It will be noted that this will also save on transmission time to the insurance company. Further, as will be readily appreciated by those skilled in the art, the text and image data comprising the file can be encoded and compressed in any manner well known in the art in order to minimize data storage and transmitting claimed requirements.

It should also be mentioned that steps **S103** and **S104** need not be performed in any particular order. In an exemplary case, the patient's x-ray may be digitized before the PAC form is called up on the computer screen **212** and completed.

During step **S105**, the PAC application is formed from the electronic PAC form and the digitized patient's x-ray. It should be noted that the present invention is not limited to a particular format for the PAC application. For example, the format of the PAC application advantageously may consist of a text file and an associated digitized image file. It should be noted that in one case the text and image files will be transmitted seriatim. For that reason, the text file (i.e., the PAC form) and the image file (i.e., the digitized x-ray) must cross reference one another (i.e., be correlated) so that these files can be continuously associated with one another after transmission to the insurance company. If the attachment is simply additional ASCII text, e.g., Operating Room Notes, then the only step necessary is to transfer the additional ASCII text into the integrated file format. Once in the integrated file format, all processing is the same as if the file contained an image attachment.

In an alternative exemplary case, the PAC application advantageously can be prepared according to the Graphic Interchange Format8 (GIF) specification, which specification is the intellectual property of CompuServe Incorporated. In order to form the PAC application, the digitized x-ray is converted to a GIF image file. It will be appreciated that the GIF image file advantageously can include one or more blocks of textual data denoted by a comment extension, as described in Version 89a of the GRAPHICS INTERCHANGE FORMAT documentation published by CompuServe, Inc. It should be noted that since the textual information corresponding to the data needed to complete the PAC form is included in the GIF image file comments, the possibility of file separation and consequent mishandling or mismatching of the separate components of the PAC application is virtually eliminated. Alternatively, the TIFF standard format advantageously can also be used to co-join field and digital image data.

It will also be appreciated that the concept of embedding comments into the GIF or TIFF image file format is a standard practice employed by those of ordinary skill in the art of graphic image preparation, e.g., by photographers and digital artists who wish to identify their works. However, it should also be noted that the use of a comment block storing data fields used in reconstructing a completed form, e.g., a completed PAC form, has never before been described or suggested. Furthermore, since the technique described above is a novel solution to electronically forwarding an insurance claim form and an associated attachment as one, the use of the comment block to store the PAC form field data is likewise a unique and novel aspect according to the present invention.

In yet another alternative exemplary case, the digitized x-ray is automatically added (inserted) to the electronic form by the service provider's AIC software and forms a single computer file, as depicted in FIG. **5B**. It should be noted that the non-text portion of the PAC application is labeled with the same provider Document Identification Number (DIN) as used on the text portion, i.e., the electronic PAC form. These two objects together now form the patient record, i.e., the patient's PAC application. The PAC application is now ready to be sent to the insurance company.

During step **S106**, the service provider's office staff then transmits the completed PAC application to the insurance company. For example, when the transmission icon of the GUI AIC software running on the service provider's computer system **210** is activated (e.g., "clicked" on), the following subsets are automatically executed:

(a) A check is first performed to ensure that the PAC application has been completely filled out. In the event that problems and/or errors are noted by the AIC software, the system user is notified of the error by an appropriate annunciator, e.g., the suspect area can be highlighted and a message concerning the problem and/or error could be generated and displayed on the monitor;

(b) A hard copy of the PAC application is printed out, if desired, by the service provider. The hard copy may advantageously be placed in the patient's permanent file;

(c) Moreover, and more importantly, the completed PAC application is archived in the service provider's computer system **210, 240**. It will be appreciated that this archive copy can be accessed in several ways such as by patient name, social security number, document identification number, etc. That is, it can be accessed using any of the information that has been entered into the PAC form; and

(d) The service provider's computer system establishes a connection with the on-line service **400** and transmits the patient's PAC application to the insurance companies e-mail address. See task **T1***a* of FIG. **3**. It will be appreciated that the e-mail addresses of all the insurance companies have been stored in the AIC software residing in the memory of computer system **210**. In short, the e-mail address is identified when the name of the payer, i.e., the insurance company, is identified in the DCF. Advantageously, the PAC application can be transmitted immediately or can be scheduled for transmission at a convenient time, i.e., can be transmitted after all of the PAC applications and other forms have been prepared for the day. Preferably, the AIC software on the service provider's computer system **210** keeps a record of when the PAC application was sent. In addition, the AIC software maintains and uses the proper protocols so that when the PAC application reaches the intended insurance company, it arrives there with the alpha-numeric portion of computer file intact, i.e., the information is stored in fields that can be read by the corresponding AIC software module in the computer system **310** at the insurance company.

It should be noted that the specific transmission path taken by the PAC application from the service provider's computer system **210** to the computer system **310** maintained by the insurance company is not an essential limitation of the novel system and corresponding operating method according to a preferred embodiment of the present invention. The only requirement of a transmission path is that it maintain the digital integrity of the PAC application computer file. Thus, the patient's PAC application can be sent to the insurance company in several ways using modems **216** and **316**, including via normal phone service, an on-line service, or bulk data transmission lines.

In an alternative exemplary case, the completed PAC applications may even be transferred to tape or CD-ROM and then sent through the U.S. Postal Service **100** of FIG. **1** to the insurance company's mailroom **320**. For purposes of the discussion which follows, only the exemplary case in which the PAC application is transmitted via the on-line service **400** is described in any detail.

One of the beneficial aspects of the present invention is provided by the combination of the dynamic claim form on the service provider's computer **210** and the use of any non-restrictive communications channel, i.e., the insurance companies are able to freely modify information requirements demanded of the service providers. Existing electronic claims processing systems, such as NEIC, are based on a clearinghouse concept, as illustrated in FIG. **6A**. In a clearing house system, all claims enter the clearinghouse computer(s), are manipulated, and then are transmitted to the appropriate insurance company. One consequence of the clearinghouse architecture is that it puts a constraint on the insurance company to use a standardized claim form. The individual insurance companies have little or no control of the information content in the form. Moreover, because the claim form is standardized, changes are very difficult to make, i.e., any change requires that all member insurance companies make the change together.

In contrast, placing AIC software packages in the providers' offices and in the insurance company processing centers, [these packages are coordinated with one another, but not identical to one another], allows every payer to transmit claim form updates to every provider. In the provider's office, the change would be reflected primarily in changes to the number of fields needing information and, rarely, in the addition of a new field to be completed by the provider. It will be appreciated that the AIC software could check for updates, and download any update located, during the PAC transmission described in detail elsewhere in this specification. Alternatively, all payer-specific updates to the DCF could be centralized on a single server, so that the service providers could check for all updates from all payers whenever the service provider transmits a completed DCF to any single payer. Moreover, the blank DCF templates advantageously could be accessed at an Internet website for either downloading or completion by the providers.

As illustrated in FIG. **6B**, the interchange between the provider's office and the insurance company(ies) advantageously can be performed using an online service or Internet Service Provider (ISP), providing that the service provider permits 8-bit file interchanges. In that case, the update information could be transmitted to the provider when the provider dials into the online service. Thus, while it is true that transmission accomplished using e-mail involves an intermediary computer, the online service merely provides a mail box and places no conditions on the insurance information contained in the claim itself.

Advantageously, the non-clearinghouse architecture and coordinated AIC software package, along with periodic updates, facilitates the provision of the dynamic claim form. That is, each insurance company can determine the content of its own claim form. The packages used by the providers are instructed regarding the information content, protocols, etc. each insurance company wants its claim to have. It will be appreciated that the package at each insurance company is designed to accept only those claims that meet the specifications of the respective insurance company. In addition, if an insurance company wants to change the content of its claim form, it can do so independently of the other insurance companies. In summary, the above combination maintains interoperability throughout the industry even while it allows information requests to change.

Beneficially, the non-clearinghouse architecture reduces costs, allows for the direct digital interchange of data from one insurance company to another, and permits many different types of forms to be run off the same system, e.g., commercial insurance claims and workers' compensation claims can both be processed in the provider's office using the same dynamic claim form. This produces a claims processing system which is more robust than anything on the market today.

During step **S107**, the PAC application is pre-processed by the value-added service provider **500**. For example, the patient's PAC application can be accessed by the employees

of the value-added service company to perform services for either the patient, the service provider, or the insurance company, or any combination thereof. See task T2 of FIG. 3. These value-added services could include archiving of the patient's dental x-rays so that all records for a particular patient are centrally stored, screening of the entire PAC application for errors, compiling statistics on all PAC applications and, in some instances, even performing the review process for the insurance company.

Next, the insurance company accesses the PAC applications at the on-line service during step S108. In an exemplary case, each insurance company has an E-mail address specifically for the purpose of receiving PAC applications. An insurance company accesses its E-mail box and finds a waiting list of PAC applications which are subsequently downloaded to GUI-capable computer system **310**. In a preferred embodiment as shown in FIG. **3**, the GUI-capable computer system **310** advantageously is connected to the claims management mainframe computer **350** of the insurance company **300**. Preferably, the GUI-capable buffer computer system **310** is a personal computer (PC) or a PC server which advantageously can be operated in parallel with but separate from the insurance company's mainframe computer **350**; data, however, beneficially can be interchanged between the buffer computer system **310** and the mainframe computer **350**. In an exemplary case, as the personnel at the insurance company **300** apply an insurance company document identification number (DIN) to each received PAC Application, the field data contained therein is copied by the buffer computer system **310** and transmitted to the mainframe computer **350**. See task T1*b* of FIG. **3**.

Alternatively, the entire PAC application advantageously could be copied by the buffer computer system **310** and downloaded to the mainframe computer **350**, where the image portion of the PAC application then can removed from the mainframe's memory. This approach employs basically the same distribution of information, i.e., text form in the mainframe **350** and field data and images in the buffer computer system **310**.

In an exemplary case, this buffer computer **310** is part of a local area network (LAN) **313**, which is connected by high bandwidth cables to personal computers or other GUI-capable terminals **311**, **312** at the desks of the individual reviewing dentists and claims adjusters, respectively. It should be noted that the necessary AIC software has been loaded onto the server **310**, the individual personal computers **311**, **312**, and the mainframe **350**. Preferably, once the patient's PAC application has been received, the system's AIC software at either the value-added service provider **500** or the insurance company's computer **310** automatically notifies the referring service provider that the PAC application has been received for processing, e.g., using a conventional E-mail message.

At step S109, the reviewing dentist calls up the graphics portion of the PAC application, in an exemplary case, from the server **310** to a personal computer **311**, each of which is running the appropriate AIC software, via the LAN **313** using the assigned DIN. See task T4 in FIG. **3**. The reviewing dentist then calls up the text portion of the PAC application from the mainframe computer **350** using the terminal **351**. It will be appreciated that the sequence can be reversed at the reviewing dentist's option. It should be noted that some small insurance companies may not even require server-LAN **310**, **313** system discussed above, but just a single PC that will incorporate the functions of the elements **310**, **311**, **312**, and **313**. In any event, the reviewing dentist calls up a patient's PAC application using both his personal computer **311** and terminal **351**. When this happens, the system AIC software automatically generates the insurance company's Predetermination Form on one of the two screens **311**, **351**. The installed AIC software advantageously can automatically transfer whatever information from the PAC application to the Predetermination form that is useful in completing the Predetermination form, e.g., repetitive information/fields. For instance, the service provider's Document Identification Number (PDIN) and the Provider Identification Number (PIN) can be transferred automatically to the Predetermination form. In addition, the AIC software can be written to display the information in the PAC form on the screen **351** in exactly the way that this particular insurance company wants it displayed.

In a alternative implementation, a single monitor on the computer **311** supporting multiple windows, at least one of which runs terminal emulation software for displaying the output of the mainframe computer **350**, could advantageously be used to display both parts of the PAC application.

With the AIC system described above, the use of "fields," the dynamic claim form, and the placing of coordinated AIC software at both the service provider's office and the insurance company, has eliminated the need for standardized forms. The result is that each insurance company gets exactly the information it wants and has it displayed in exactly the way it wants. Thus, the compromise of a standardized claim form as is required with the present NEIC system is avoided.

In an exemplary case, the reviewing dentist is provided with three monitors or a large graphics-capable monitor having a multi-page display mode, on which can be displayed the three pages of the patient file. It will be appreciated that this configuration is optimized to facilitate rapid review of the PAC application. The reviewing dentist enters an Insurance Company Document Identification Number (DIN) at this point, which number is affixed to all three pages of the patient's file.

During step S110, the reviewing dentist reviews the PAC application. More specifically, the review process consists of a review of the medical facts or evidence (i.e., the text and x-ray information in the PAC application), as well as a review of the patient's insurance policy. Once the reviewing dentist has made his analysis, he goes to the Predetermination form, i.e., the third page, and enters the required information to either approve or disapprove the procedure during step S111. The specific details regarding the information provided by the reviewing dentist will depend on the procedures established at each individual insurance company. Either the reviewing dentist or another person, e.g., a claims adjuster, will do the review of the patient's insurance policy.

Advantageously, there are several ways to gain access to this information. First, the server **310** can have information on every policy holder loaded into its memory. Second, the benefits reviewer, i.e., either the reviewing dentist or the claims adjuster, can have another monitor **351**, **352** on his desk that is connected to the company mainframe computer **350**. Thus, all that the benefits reviewer must do is select the patient's insurance ID number and his benefits sheet will appear. The benefits reviewer then reads off the information that must be entered in the Predetermination form and enters the information into the either the GUI-capable computer system **310/311/312** of the mainframe computer **350** during step S111. It should again be noted that there is an electronic connection, in the preferred embodiment, between the mainframe computer **350** and the server **310**. Whatever informa-

tion is deemed necessary by that particular insurance company to complete the Predetermination form can be transferred between the mainframe computer **350** and the buffer computer system **310** by entering data on one of the terminals **311, 351**. See, for example, task T5 in FIG. **3**.

At this point, the Predetermination form is ready to be sent to the referring service provider. When the transmit icon on the computer screen of the benefit reviewer's GUI-capable computer system **311**, for example, is activated (e.g., by being "clicked" on), the following substeps are automatically performed:

(a) First, a check is performed to verify that the Predetermination form has been completely and properly filled out. If errors are detected, the AIC software notifies the operator via an appropriate annunciator;

(b) The Predetermination form and the patient's PAC application are downloaded to the buffer computer **310**. See task T5*a*. From this platform, the company accesses the on-line service **400** and transmits the Predetermination form, i.e., just the information "fields", to the service provider's e-mail address, which is stored in the memory of server **310**. See task T6. In the AIC software, records are kept as to which PAC applications have been sent and when and to whom. The proper protocols are used so that when the application reaches the service provider, it arrives there as a computer readable file, i.e., the information is stored in "fields" that can be read by the AIC software at both the insurance company and the service provider's office;

(c) A hard copy of the Predetermination form and x-ray are printed, if desired, by the insurance company, see task T7;

(d) The complete patient file is archived in the insurance company's computer system **310, 340**, if desired. See task T8. Otherwise, just the electronic Predetermination form and the PAC application are saved; and

(e) The entire three page patient file is now cleared from the reviewing dentist's displays **311, 351** and the AIC software prompts the reviewing dentist as to whether another patient file should be accessed.

During step **S112**, the service provider accesses his e-mail address with the on-line service **400**. All Predetermination forms which have been received are automatically delivered to the service provider's computer system **210** for insertion into the appropriate patient file. The service provider then reviews the Predetermination forms. Upon evaluating the decision of the reviewing dentist, the service provider can either perform the procedure (if approved) or discuss the matter with the patient's insurance company (if not approved).

During step **S113**, the approved procedure is performed by the service provider. Once the approved procedure has been completed, the service provider preferably sends in the Final Payment Claim (FPC) form. In an exemplary case, this could be as simple as just filling out another section of the Predetermination form and signing it using the electronic signature pen, as discussed above. It should be noted that in FIG. **3**, this is labeled as P*. Alternatively, if the insurance company so desires, a separate form just for this purpose can be employed. This latter form, which advantageously is the same dynamic claim form discussed above, is stored in the memory of the provider's computer, must have the Insurance Company's DIN for this particular patient's procedure and all other needed information transferred to it, which advantageously can all be done by the AIC system software at step **S114**. At step **S115**, the Final Payment Claim form is transmitted back to the insurance company. See task T9 of FIG. **3**. In an exemplary case, activating the transmit icon on the service provider's computer system **210**, e.g., by "clicking" on it, automatically results in the execution of the following substeps:

(a) A check is performed to see that the form has been completely and correctly filled out. If an error has occurred, the AIC software alerts the operator of the detected error;

(b) A hard copy of the form is printed out, if desired, by the service provider;

(c) The complete patient's electronic file is archived in the service provider's computer system **210, 240**. It will be noted again that the patient's electronic file can be accessed by patient name, social security number, document identification number, etc.; and

(d) The computer system **210** establishes a connection with the on-line service and transmits the patient's Final Payment Claim (FPC) form to the insurance company's e-mail address.

As previously discussed, the AIC software on the service provider's computer system **210** advantageously may include facilities for transmitting the Final Payment Claim form to the insurance company at a later time, e.g., for transmitting all of the days PAC application and FPC forms at one time.

It will also be noted, as discussed above, that the AIC software maintains records as to which claim form was sent and when it was sent to the insurance company. In an exemplary case, the E-mail address to which the Final Payment Claim form is sent is different from the address used in transmitting the PAC application. Since the Final Payment Claim form does not include a digitized image, i.e., a digitized x-ray, the insurance company may choose to have the Final Payment Claim form directed to an E-mail address accessible from the mainframe computer **350**. If the insurance company's processing protocol requires an independent review of the PAC application, the Predetermination form and the Final Payment Claim form before payment can be authorized, the E-mail address advantageously can be accessed from either the server **310** or the mainframe computer **350**, since these two computer systems are electrically coupled at the insurance company **300**.

The insurance company then receives the Final Payment Claim forms during step **S116** when it accesses its Final Payment Claim forms mail box. In an exemplary case, the computer system receiving the Final Payment Claim forms is not the claims management mainframe computer **350** of the insurance company but, rather, it is a personal computer or server **310** that is part of a parallel system having an electronic connection to the mainframe computer **350**. This buffer computer **310** advantageously can be part of a LAN **313**. The buffer computer **310** is connected by high bandwidth cables to the personal computers or GUI-capable terminals **312** located at the claims adjusters's desks. See task T10. It should again be noted that the appropriate AIC software modules have been loaded onto both the server **310**, the personal computers **312** and the mainframe computer **350**. It will be appreciated that the information entered in computer **312** advantageously can be automatically transferred to the mainframe **350** through the transmission path including the computer **312**, the buffer computer **310** and the electronic connection to the mainframe computer **350**.

The Final Payment Claim form is then reviewed during step **S117**. The adjuster reviewing the Final Payment Claim form can, if necessary, call up the PAC application from the memory of the server **310**, since the original Insurance

Company Document Identification Number for the corresponding PAC application was transferred to the Predetermination form and, thus, to the Final Payment Claim form. In addition, the adjuster can, if need be, call up the information on the insurance policy of the particular patient stored in mainframe computer **350** via terminal **352**. Preferably, the insurance company provides the adjuster with a separate monitor **352** connected to the claims management mainframe computer **350**.

Whatever internal paperwork is necessary to be filled out is automatically downloaded with the Final Payment Claim form itself by the appropriate AIC software module. Part of this paperwork will preferably be form(s) which must be completed so as to order a check issued to the service provider along with an Explanation of Benefits (EOB). Also at step **S118**, whatever information is necessary to be entered into the mainframe **350** can be entered directly through the use of the terminal **352** or indirectly through computer **312**, the buffer computer **310** and the electronic connection to the mainframe computer **350**.

Finally, upon activating the transmit icon on the insurance company's personal computer **312**, for example, the following substeps are automatically executed:

(a) A check is again performed to see that the form has been completely and correctly completed and the operator is notified if an error has occurred;

(b) A hard copy of the form is printed out, if desired by the insurance company;

(c) The complete patient file is archived in the insurance company's computer system, e.g., on the server. It should again be noted that the patient file can be accessed using the patient's name, social security number, or an assigned document identification number, etc.; and

(d) A payment draft is issued, in the approved amount, to the service provider. This can be done through any number of methods, including printing a hard copy check and forwarding it through the U.S. postal service, electronic funds transfer, etc. Each form of payment will be accompanied with the normal description of the service to which these funds should be applied, i.e., the EOB (Explanation of Benefits).

The preferred embodiment was described as transmitting digitized dental x-rays as part of an integrated PAC application file transmitted between a service provider and an insurance company. However, the present invention is broadly directed to the integrated transmission of any "electronic text form" and any "attachment." Further, the present invention is not limited to transmissions between providers and insurance companies. Rather, it is intended to facilitate the transmission of electronic forms with attachments between any person or organization and any other person or organization.

For example, the present invention has utility in such other areas as Property/Casualty Insurance, law enforcement, and Internet marketplaces. Thus, the "attachment" need not be an x-ray or other type of image. Rather it can be any information which is not easily incorporated into an associated "electronic text form" and/or cannot be easily displayed on an existing legacy computer system. Attachments can include, but are not limited to, pictures, graphs, sound recordings, and nonstandard text. Examples would be x-rays, CTS, MIS, EKG or EEG recordings, i.e., strip charts, digitized video signals such as Moving Picture Experts Group (MPEG) compressed video signals, transcriptions of Operating Room Notes, estimates for repairs to a house or car, EOB (Explanation of Benefits), additional ASCII text, and the like. As used in this description, all particulars regarding a specific "attachment," such as medical specialty, acquiring modality, the patient's problem, etc., can be ignored. These are details having absolutely no bearing on the essence of the present invention. The only requirements are that the information must be something that can be digitized and therefore put into the form of a computer file, and that once in this form, it can be "read, reviewed or interpreted" by the person or organization receiving it.

In addition, it should be noted that the DCF could be usefully employed independent of the "attachments" problem. The DCF is an electronic form (with specific fields that must be filled out) that adjusts itself, in both information required and formatting, to meet the demands of the receiving party. Furthermore, it does this while maintaining a Standard User Interface. It is particularly advantageous for Electronic Data Interchange (EDI) situations where a user must send similar (but not necessarily identical) messages to several organizations. This is particularly important where, once an electronic form is received by those organizations, the information in the message must be digitally integrated into differing information systems.

The exemplary preferred embodiment discussed above addresses only a stand-alone system of computers, which is independent of the practice management software in the local dentist's office, the claims management software at each insurance company, and of clearinghouses such as NEIC. However, it will be appreciated that there is an entire spectrum of different ways to structure a system which will support "attachment integrated claims" which will be readily apparent to a person of ordinary skill in the art (after having the benefit of the present disclosure), all of which are encompassed by the present invention.

It should also be noted that the AIC software described thus far has been independent of the service provider's practice management software. However, one alternative preferred embodiment calls for integrating the AIC software with the practice management software. This would further reduce the amount of time spent actually filling out the PAC application and the other paperwork involved in the overall claims process.

Electronic filing of standard 100% text claims is now being supported by many practice management systems and by stand-alone electronic claims software systems. In another alternative preferred embodiment, the AIC software could be incorporated into these systems as a means of sending the x-ray part of the PAC application.

It should also be mentioned that the present invention represents a total solution on three levels to the problem of streamlining the processing of insurance claim forms with attachments. First, the system from provider to third party payer is totally digital. The present invention includes an integrated system of hardware and AIC software that allows: (1) providers to create an electronic (digital) version of a patient's PAC application (text and x-ray); (2) providers to transmit the PAC application to an insurance company; and (3) the insurance company to read the patient's PAC application. Thus, it creates a coherent system for the filing, transmission and processing of "claims with attachments."

Secondly, the present invention is an industry-wide system which allows every provider to interface with every third party payer. Finally, the present invention is a system which permits all communications between the service provider and the insurance company to be totally electronic. The present invention makes the entire process electronic from the initial preparation of the PAC form to the payment of the final claim. Communication is digital in both directions.

As discussed above, the patient, the service provider, the insurance company, or any combination thereof may prefer that all communication be performed through a value-added service provider **500**. The services performed by the value-added service provider **500** advantageously could include any or all of the services listed immediately below.

First, the value-added service provider **500** may act as a National Dental Data Bank (NDDB), i.e., a data bank storing patient dental images. Limited information regarding the patient from the PAC form is attached to the digital x-ray to produce a digitized x-ray record. This information could include, for example, the date that the x-ray was taken, the identity of the service provider who took the x-ray, the patient's name and social security number, etc. The digitized x-ray record is archived at NDDB for the patient. This would allow the retrieval of the x-ray by the patient at any time for any reason, e.g., the patient could ask that the x-ray and claim be sent to another dentist for a second opinion and/or for a second price estimate. In fact, the patient may request that the PAC application be sent to other qualified service providers so that they could competitively bid on the needed procedure.

In addition to the NDDB function, the value-added service provider **500** could perform pre-screening of the PAC applications for errors and could provide statistics to both the service providers and the insurance companies regarding, for example, the frequency at which a procedure is performed or the frequency at which follow up treatment is required after a first procedure is performed. The value-added service provider **500** could also do the prior approval review for an insurance company or could provide other services tailored to suit the needs of the service provider, the patient, and/or the individual insurance company.

It should be mentioned that there are three outside areas of software that advantageously can be taken into consideration, or ignored, with the present invention. These are practice management software run by the service provider, claims management software run by the insurance company, and clearinghouse software. The present invention allows for the entire spectrum of interfacing, from a totally stand-alone system for electronic claims processing to one that is fully integrated with practice management software, claims management software, and the NEIC. Moreover, the present invention is specifically contrived so that it can be used simultaneously in all modes. That is, one insurance company could choose to have no interfacing between the computer **310** running the AIC software and its mainframe computer **350**, while, at the same time, another insurance company could choose to have AIC software running simultaneously on both the mainframe computer **350** and the buffer computer system **310**. Thus, each operating mode or methodology could be considered to be a different preferred embodiment of the present invention, notwithstanding the fact that all modes are expected to be operating simultaneously.

The present invention was motivated by a desire to solve a problem which has existed for many years. The AIC software was designed with this in mind. Thus, for example, redundant information is automatically moved from one form and file to another along the chain of operating steps, i.e., from one document to another within a given insurance company's set of forms. Moreover, the AIC software advantageously can be written in C++ or some other appropriate programming language. The reason for this is so that when information in entered into areas of the electronic PAC forms, it is entered as a "field." Being a "field" it can be used as a logic control device, as discussed in greater detail above.

The overall workflow problem to be addressed is treated as a coherent whole. Thus, AIC software is specifically designed so that, at each step of the preferred operating method, the fact that the information is in digital form is used to streamline the process. Thus, the AIC software is designed to eliminate inefficiencies and deficiencies that exist in current claims handling systems. For example, the information itself can be used as a logical control device and it can also be transferred from one document to another. It should be noted that all available forms are written into the AIC software so that they are coordinated with one another, that is, they know where each has a similar "field."

It should also be noted that the AIC software automates much of the overall insurance claims processing, thus eliminating many of the areas that are repetitive or prone to human error. These areas include the following:

(a) Filling in the service provider's information. Although each insurance company may require something different in the way of service provider information, the AIC software can store consolidated service provider information so that the information need be entered only once. For example, the service provider need only enter his telephone number once; the AIC software can reformat this basic information specifically for each individual insurance company's form;

(b) Transmitting the PAC application to the correct e-mail address, thus eliminating the errors associated with hand addressing and stamping the mailing envelope;

(c) Checking each completed form, i.e., PAC application and Predetermination form, for accuracy and completeness, while it is still at the provider's office or the insurance company; and

(d) Simultaneously transmitting, archiving, and printing the completed forms, e.g., the PAC application.

It will be appreciated that many such advantages will be evident to those of ordinary skill in the art from having the requisite PAC form stored in the AIC software on the service provider's computer system **210**, **240**.

Moreover, the AIC system advantageously can be optimized to limit unnecessary information. For example, the system can make use of scanners **220** which have portions of their scanning area physically or electronically masked out, which reduces both scanning time and transmission time by minimizing the size of the digitized x-ray produced, for example, during step **S104**. The provisions for the use of digital and digitized signatures also eliminates unneeded paper shuffling.

It should again be noted that the major improvement in efficiency attributable to the AIC system results from combining or coordinating an electronic PAC form with an electronic (digitized) x-ray. This electronic x-ray will have a document identification number assigned to it.

In addition, the AIC system and corresponding method according to preferred embodiments of the present invention provide several convenience features which are only possible when using a fully electronic filing system. For example, the AIC system facilitates automatic acknowledgment by the insurance company that it has received the PAC application. Moreover, the AIC system provides automatic transfer of pertinent information from the PAC application to the Predetermination form. Furthermore, the AIC system components at the insurance company preferably allow simultaneous viewing of the three documents needed to complete the Predetermination form. In addition, the AIC system and requisite software automates the entire transmitting and archiving processes of the PAC application and the Predetermination form at the insurance company.

In some instances, the electronic reuse of the Predetermination form as the Final Payment Claim form means that the service provider need only indicate the date that the procedure was performed and enter the service provider's facsimile or electronic signature. The AIC software module at the provider's office requests these be entered into P, i.e., the Predetermination form, to create P*, i.e., the Final Payment Claim form, and then transmits P* to the final claims e-mail address for payment. Moreover, the only information that needs to be sent from the service provider to the insurance company is the insurance company's assigned document identification number, the date of completion and the service provider's signature.

The preferred embodiments of the AIC system according to the present invention provide dentists in the field with the necessary hardware and software which allows them to create an electronic (digital) version of a patient's PAC application, both the text and the required patient x-ray. The AIC software automatically adds these two data types together to form a single entity, the patient's PAC application. Moreover, the AIC system provides the insurance companies with hardware and software which allows them to read the patient's electronic PAC application. For each insurance company, this application is tailored so that it contains the specific information required by that company and it contains that information in the form required by that company. As such, the necessity to force standard formats on the insurance industry is eliminated. Moreover, the AIC system and software automatically attaches a partially filled out Predetermination form to the patient's PAC application when it is called up for review and approval. Moreover, the AIC system and software completely eliminates the time consuming process of actually handling the patient's film x-ray by insurance company personnel.

Other modifications to and variations of the invention will be apparent to those skilled in the art from the foregoing disclosure and teachings. Thus, while only certain embodiments of the invention have been specifically described herein, it will be apparent that numerous modifications may be made thereto without departing from the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. A graphical user interface (GUI) instantiated by computer software for generating a file from text data entered into selected ones of N fields in the GUI, wherein the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields, and wherein N is an integer greater than 2.

2. The GUI as recited in claim **1**, wherein the first portion of the selected ones of the N fields are automatically filled in when the text is entered into the first predetermined one of the N fields.

3. The GUI as recited in claim **1**, wherein the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields.

4. The GUI as recited in claim **3**, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

5. A combination of storage media storing computer readable instructions for permitting non-networked computers to cooperate synergistically, comprising:

a first storage medium storing computer readable instructions for permitting a first computer system to generate a form including N fields, to receive textual data as field data in selected ones of the N fields, to assemble said field data and a corresponding digitized attachment into a first file and to transmit the first file to a second computer system via a communications channel;

a second storage medium storing computer readable instructions for permitting the second computer system to receive said first file via the communications channel, to display the corresponding digitized attachment on a second screen of the second computer system, and to transfer said field data to a third computer operatively connected to the second computer; and

a third storage medium storing computer readable instructions for permitting the third computer system to receive said field data from said second computer, to display said field data on a third screen of the third computer system and to generate a second file including portions of said field data extracted from said first file,

wherein the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields, and

wherein N is an integer greater than 2.

6. The combination as recited in claim **5**, wherein the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields.

7. The combination as recited in claim **6**, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

8. The combination as recited in claim **5**, wherein said digitized attachment is a digitized x-ray.

9. The combination as recited in claim **5**, wherein said instructions in said second and said third storage media permit said field data, said digitized attachment and said second file to be simultaneously displayed.

10. A method for operating a computer system including first, second and third computers, each of said first, second and third computers including a memory, an input device, and a display, respectively, said first and said second computers being connected to one another by modems and a common communication line, and said first computer including a digitizing device, said method comprising the steps of:

(a) retrieving a first form including N fields from storage in the first computer's memory and displaying said first form on the first computer's display;

(b) selecting M of the N fields responsive to text entry into a first predetermined one of the N fields;

(c) writing first field data to said first form using the first computer's input device;

(d) digitizing a patient's x-ray to thereby generate a digitized x-ray;

(e) combining said digitized x-ray and said first form so as to generate an attachment integrated file;

(f) transmitting said attachment integrated file to the second computer;

(g) transmitting said first field data from said second computer to said third computer;

(h) generating a second form upon receipt of said attachment integrated file, said first and second forms containing at least a portion of said first field data;

(i) displaying said first form, said second form and an image corresponding to said digitized x-ray on respective displays of said third computer and said second computer;

(j) writing second field data to said second form using said third computer's input device;

(k) transmitting said first and second field data corresponding to second form back to the first computer,

wherein M and N are both integers greater than 2.

11. The method as recited in claim **10**, wherein the selected ones of the M fields is further limited responsive to text entry into a second predetermined one of the N fields.

12. The method as recited in claim **11**, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

13. The method as recited in claim **10**, further comprising the steps of:

(l) receiving said first and second field data corresponding to said second form on the first computer;

(m) reconstructing and displaying said second form on the first computer's display;

(n) adding completion data to said second form using the first computer's input device to thereby convent said second form into a third form; and

(o) transmitting said first and second field data and said completion data corresponding to said third form from the first computer to a selected one of said second and third computers.

14. The method as recited in claim **10**, further comprising the steps of:

(p) receiving said first and second field data corresponding to said second form on the first computer;

(q) generating a third form responsive to receipt of said first and second field data corresponding to said second form;

(r) automatically transferring selected portions of said first and second filed data to said third form;

(s) entering completion data into said third form using the first computer's input device; and

(t) transmitting said selected portions of said first and second field data and said completion data corresponding to said third form from the first computer to a selected one of said second and third computers.

15. The method as recited in claim **10**, wherein said step (f) comprises the steps of:

(f)(i) transmitting said attachment integrated claim application to an on-line service; and

(f)(ii) transmitting said attachment integrated claim application from said on-line service to the second computer.

16. The method as recited in claim **10**, wherein said step (j) comprises the steps of:

(j)(i) transmitting said second form to an on-line service; and

(j)(ii) transmitting said second form from said on-line service to the first computer.

17. The method as recited in claim **10**, wherein:

said attachment integrated claim application is a Prior Approval Claim application;

said digitized x-ray comprises one field of said attachment integrated claim application; and

said second form is a Predetermination form.

18. A combination of storage media which store computer readable instructions for permitting M×(N×R) non-networked computers to form a coherent system, comprising:

M first storage medium storing computer readable instructions for permitting each of M first computer systems to receive textual data as field data, to assemble said field data and a corresponding digitized attachment into a first file and to transmit the first file to a selected second computer system and a selected third computer system via at least one communications channel;

N second storage medium storing computer readable instructions for permitting the selected second computer system of N second computer systems to receive said first file via at least one communications channel, and to display the corresponding digitized attachment on a second screen of the selected second computer system; and

R third storage medium storing computer readable instructions for permitting the selected third computer system of R third computer systems to receive said field data of said first file via the at least one communications channel, and to display said field data on a third screen of the selected third computer system,

wherein:

M, N, and R are each a positive integer greater than one,

said selected second computer system and the selected third computer are selected by one of the M first computer systems responsive to address information included in the field data in the first file, and

multiple items in the field data is selected by diagnostic code included in the field data.

19. The combination as recited in claim **18**, wherein:

the M first storage medium store computer readable instructions permit each of the M first computer systems to receive additional textual data as additional field data, to assemble said additional field data and a corresponding digitized attachment into a second file and to transmit the second file to a second alternate computer system and a third alternative computer system via at lease one communications channel;

the N second storage medium store computer readable instructions which permit the second alternative computer system of N second computer systems to receive said second file via the first communications channel, and to display the corresponding digitized attachment on a fourth screen of the second alternative computer system; and

the R third storage medium stores computer readable instructions which permit the third alternative computer system of R third computer systems to receive said additional field data of second file via said the at least one communications channel, and to display said additional field data on a fifth screen of the third alternative computer system; and

the selected second and third computer systems and the second and third alternate computer systems are designated when the field data and the additional field data are entered in the dynamic claim form, respectively.

20. The combination as recited in claim **18**, wherein the communication channel further comprises:

a first communications channel operatively coupling the first and second computer systems; and

a second communication channel operatively coupling the first and third computer systems.

21. The combination as recited in claim **18**, wherein said communications channel further comprises a first communications channel, a clearing house server, and a second communications channel, arranged in the recited order, operatively coupling the first computer system to the second and third computer systems.

22. The combination as recited in claim 21, wherein the communications channel further comprises a third communications channel operatively coupling the second and third computer systems.

23. A graphical user interface (GUI) instantiated by computer software for generating a file transmittable to a selected one of M recipients from text data entered into selected ones of N fields in the GUI, wherein:

the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields,

the computer software is updated as the respective file requirements of the M recipients change, and

N is an integer greater than 2.

24. The GUI as recited in claim 23, wherein the first portion of the selected ones of the N fields are automatically filled in when the text is entered into the first predetermined one of the N fields.

25. The GUI as recited in claim 23, wherein the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields.

26. The GUI as recited in claim 25, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

27. The GUI as recited in claim 26, wherein the computer software is automatically updated whenever the file is transmitted to the one of the M recipients corresponding to the payer name.

28. The GUI as recited in claim 23, wherein the computer software is automatically updated from a single source accessible by all of the M recipients.

29. The GUI as recited in claim 23, wherein the computer software resides on a server computer accessible via the Internet.

30. The GUI as recited in claim 29, wherein the file is transmitted from the server to the selected one of the M recipients.

31. A graphical user interface (GUI) instantiated by computer software for generating a file transmittable to a selected one of M recipients from text data entered into selected ones of N fields in the GUI, wherein:

the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields,

the format of the file is determined responsive to text entered in the first predetermined one of the N fields, and

N is an integer greater than 2.

32. The GUI as recited in claim 31, wherein the first portion of the selected ones of the N fields are automatically filled in when the text is entered into the first predetermined one of the N fields.

33. The GUI as recited in claim 31, wherein the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields.

34. The GUI as recited in claim 33, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

35. The GUI as recited in claim 31, wherein the computer software resides on a server computer accessible via the Internet.

36. The GUI as recited in claim 29, wherein the file is transmitted from the server to the selected one of the M recipients.

37. A coherent computer system providing interoperability between a plurality of independent computers, comprising:

a plurality of first computers, each of the first computers comprising a first storage medium storing computer readable instructions for permitting the respective first computer to:

generate a form including N fields;

receive textual data as field data in selected ones of the N fields;

assemble said field data into a first file; and

transmit the first file to a selected one of a plurality of second computers via a communications channel; and

the second computers, each of the second computers comprising a second storage medium storing computer readable instructions for permitting the respective second computer to:

receive said first file via the communications channel, and

display said field data on a screen of the respective second computer,

wherein:

the selected ones of the N fields which accept text data are determined responsive to text entered into a first predetermined one of the N fields,

the selected one of the respective second computers is selected responsive to the text entered into the first predetermined one of the N fields,

the computer readable instructions stored on the first computers are updated responsive to changes to the selected ones of the N fields generated by a respective one of the second computers, and

N is an integer greater than 2.

38. The coherent computer system as recited in claim 37, wherein the selected ones of the N fields is further limited responsive to text entry into a second predetermined one of the N fields.

39. The coherent computer system as recited in claim 38, wherein the first predetermined one of the N fields accepts a payer name, and wherein the second predetermined on of the N fields accepts a CPT code.

40. An electronic claim form instantiated by a Graphical User Interface (GUI) which permits each of a plurality of first users to complete and then electronically transmit N forms to N respective second users, wherein each of the N forms differs from the remaining N forms in terms of one of content and format.

41. A dynamic electronic form which permits each of a plurality of first users to independently determine the information content of its respective electronic form, and to freely change the information over time.

42. The dynamic electronic form as recited in claim 41, wherein the electronic form presented to each of a plurality of second users is constant, irrespective of changes to the information content dictated by a respective one of the first users.

43. A dynamic electronic form accessible via a computer which provides a first user with the ability to freely select a second user from a plurality of second users, and which assists the first user in determining, assembling, and transmitting information specifically required by the second user, wherein the dynamic electronic form maintains a constant appearance irrespective of changes to required information established by any of the second users.

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US006505176B2

(12) **United States Patent**
DeFrancesco, Jr. et al.

(10) **Patent No.: US 6,505,176 B2**
(45) **Date of Patent: *Jan. 7, 2003**

(54) **WORKFLOW MANAGEMENT SYSTEM FOR AN AUTOMATED CREDIT APPLICATION SYSTEM**

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(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 49 days.

(21) Appl. No.: **09/097,148**

(22) Filed: **Jun. 12, 1998**

(65) **Prior Publication Data**

US 2001/0014877 A1 Aug. 16, 2001

(51) **Int. Cl.**[7] **G06F 17/00**
(52) **U.S. Cl.** **705/38**
(58) **Field of Search** ..... 705/38, 35, 4, 705/8, 9, 11, 7, 40, 16, 17, 39; 707/10 A

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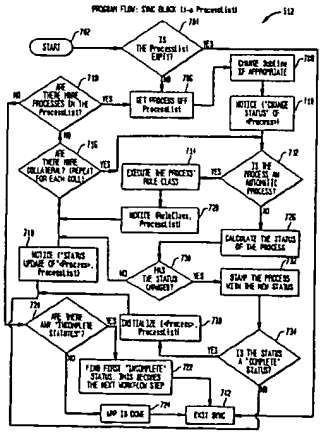
(57) **ABSTRACT**

A workflow management system for an automated credit application processing system. The workflow management system automatically coordinates the workflow among various workgroups and entities involved in the credit application process. The steps and rule tests that define an organization's workflow are customized according to the workflow requirements and process steps for each organization. The workflow manager allows application steps to be processed simultaneously by various entities involved in the loan application process. Workgroups are defined for each preconfigured workflow definition. Each workgroup is associated with a particular set of functions. A workgroup queue is provided for each workgroup. Workgroup queues contain active or pending steps associated with the workgroup. In operation, users can obtain status information by viewing data from the various workgroup queues. A relational database management system is used to link a plurality of tests with each workflow process step that is defined for particular workflow. The tests are linked to rule elements which are linked to database elements that are linked to functions that alter the database elements. Accordingly, when a function is executed, the workflow management system automatically determines which particular workflow process steps are potentially affected by the executed function. Then, the workflow management system evaluates those steps to determine their status and to further determine the process steps to be activated next.

25 Claims, 10 Drawing Sheets



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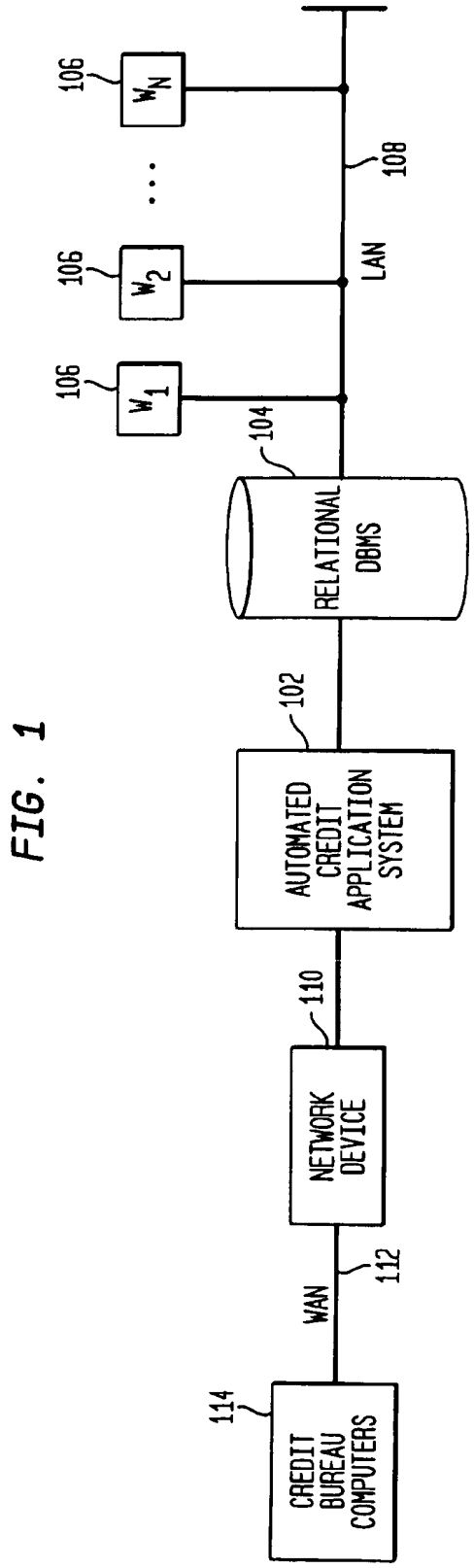

106
W_N
106
W_2
106
W_1
108
LAN
104
RELATIONAL DBMS
102
AUTOMATED CREDIT APPLICATION SYSTEM
110
NETWORK DEVICE
112
WAN
114
CREDIT BUREAU COMPUTERS

FIG. 1

FIG. 2

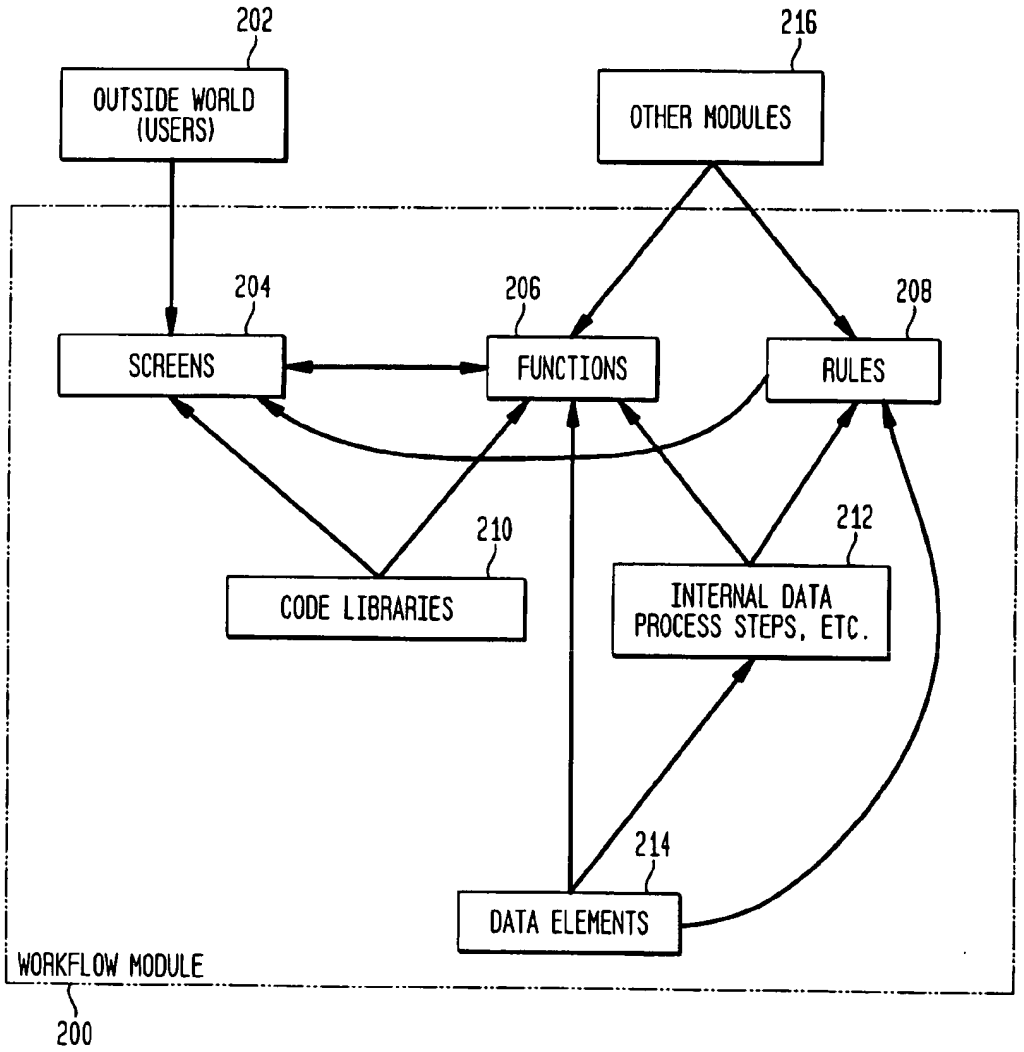

202
OUTSIDE WORLD (USERS)
216
OTHER MODULES
204
SCREENS
206
FUNCTIONS
208
RULES
210
CODE LIBRARIES
212
INTERNAL DATA PROCESS STEPS, ETC.
214
DATA ELEMENTS
WORKFLOW MODULE
200

FIG. 3
WORKFLOW OVERVIEW

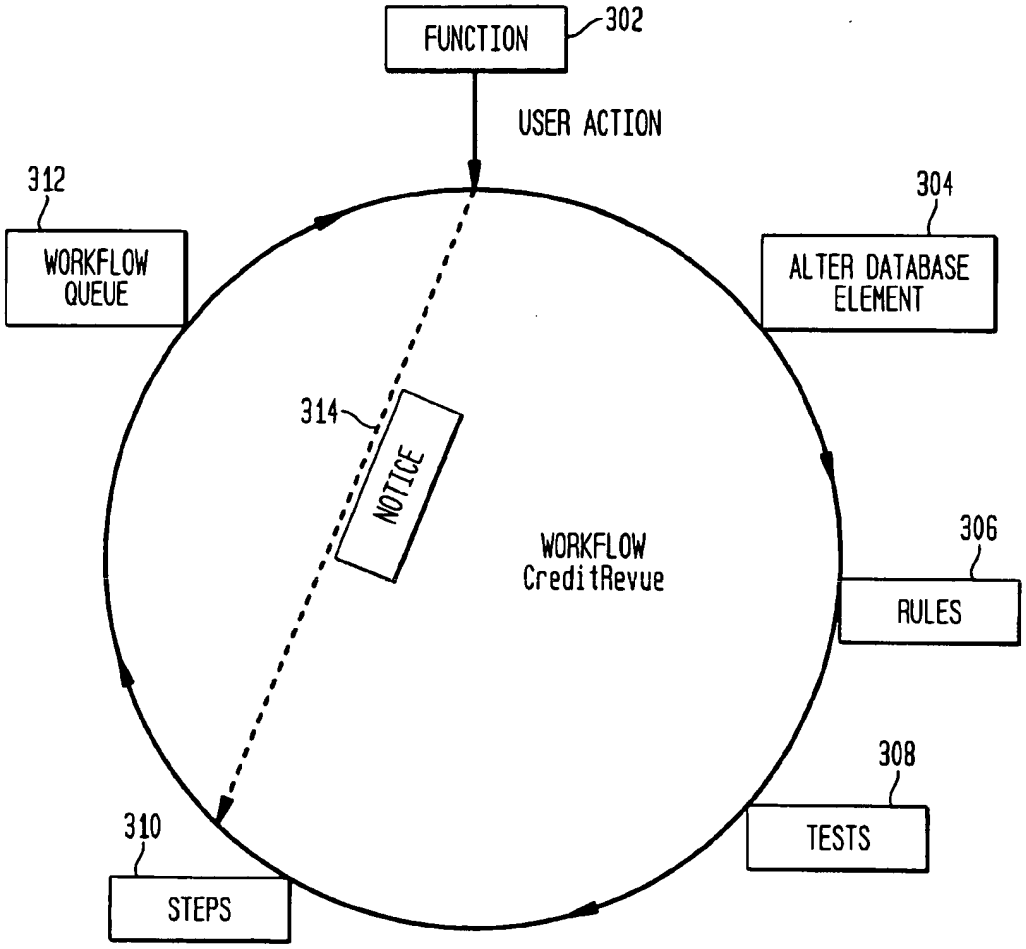


FIG. 4

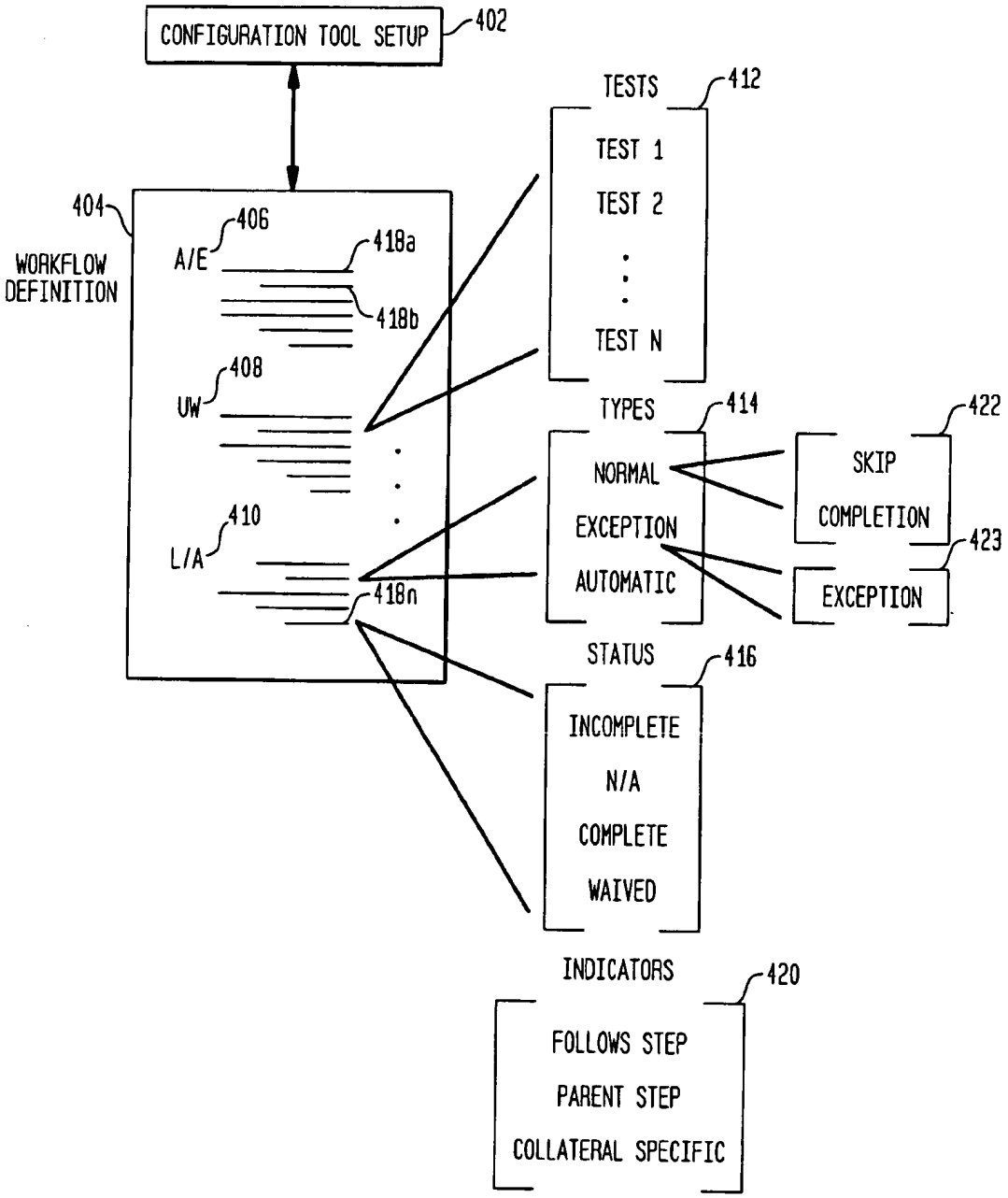

CONFIGURATION TOOL SETUP
402
TESTS
412
TEST 1
TEST 2
TEST N
404
WORKFLOW DEFINITION
406
A/E
418a
418b
408
UW
410
L/A
418n
TYPES
414
NORMAL
EXCEPTION
AUTOMATIC
422
SKIP
COMPLETION
423
EXCEPTION
STATUS
416
INCOMPLETE
N/A
COMPLETE
WAIVED
INDICATORS
420
FOLLOWS STEP
PARENT STEP
COLLATERAL SPECIFIC

FIG. 5
PROGRAM FLOW: WORKFLOW BLOCK

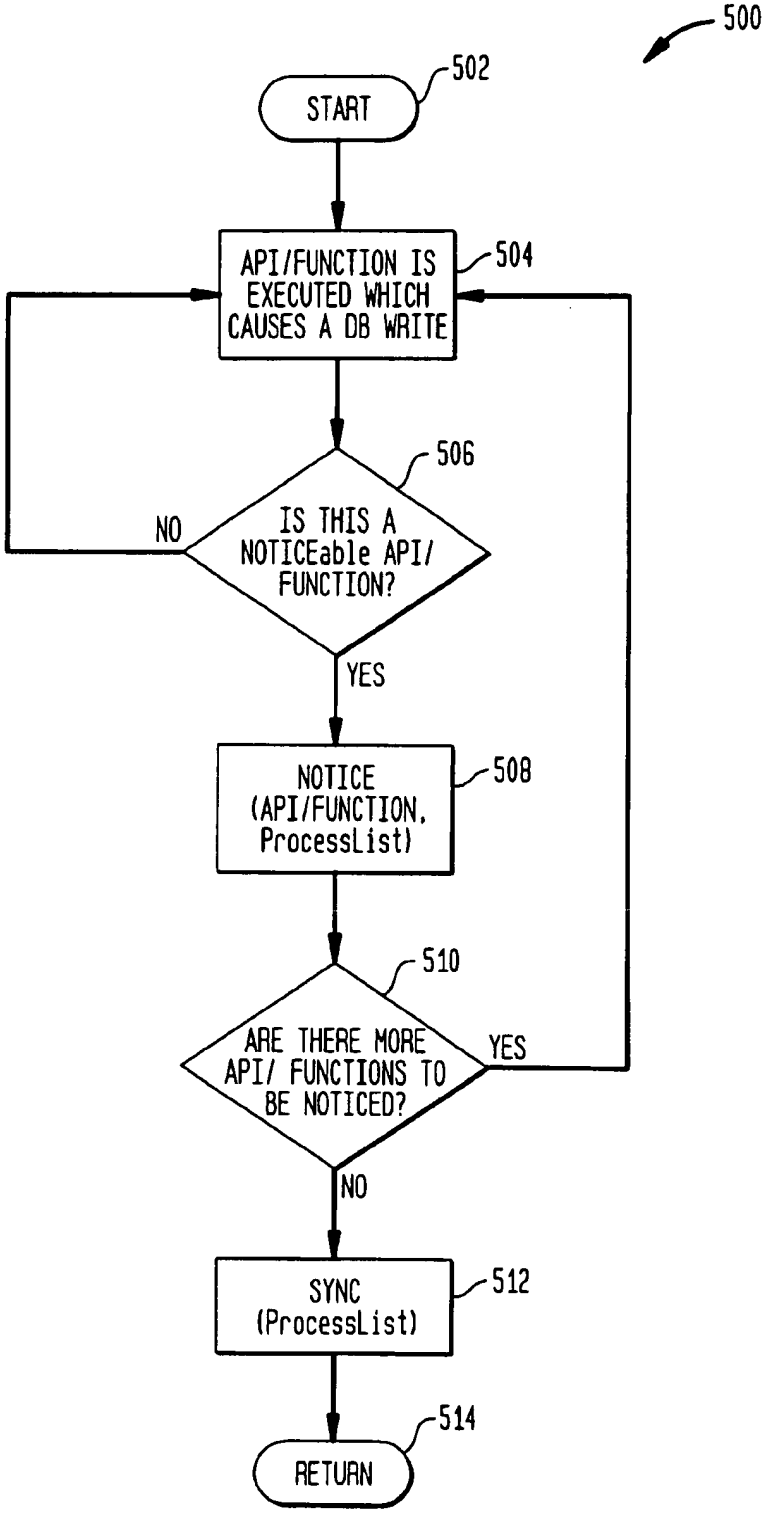


FIG. 6

PROGRAM FLOW: NOTICE BLOCK (i API/FUNCTION, i-o ProcessList

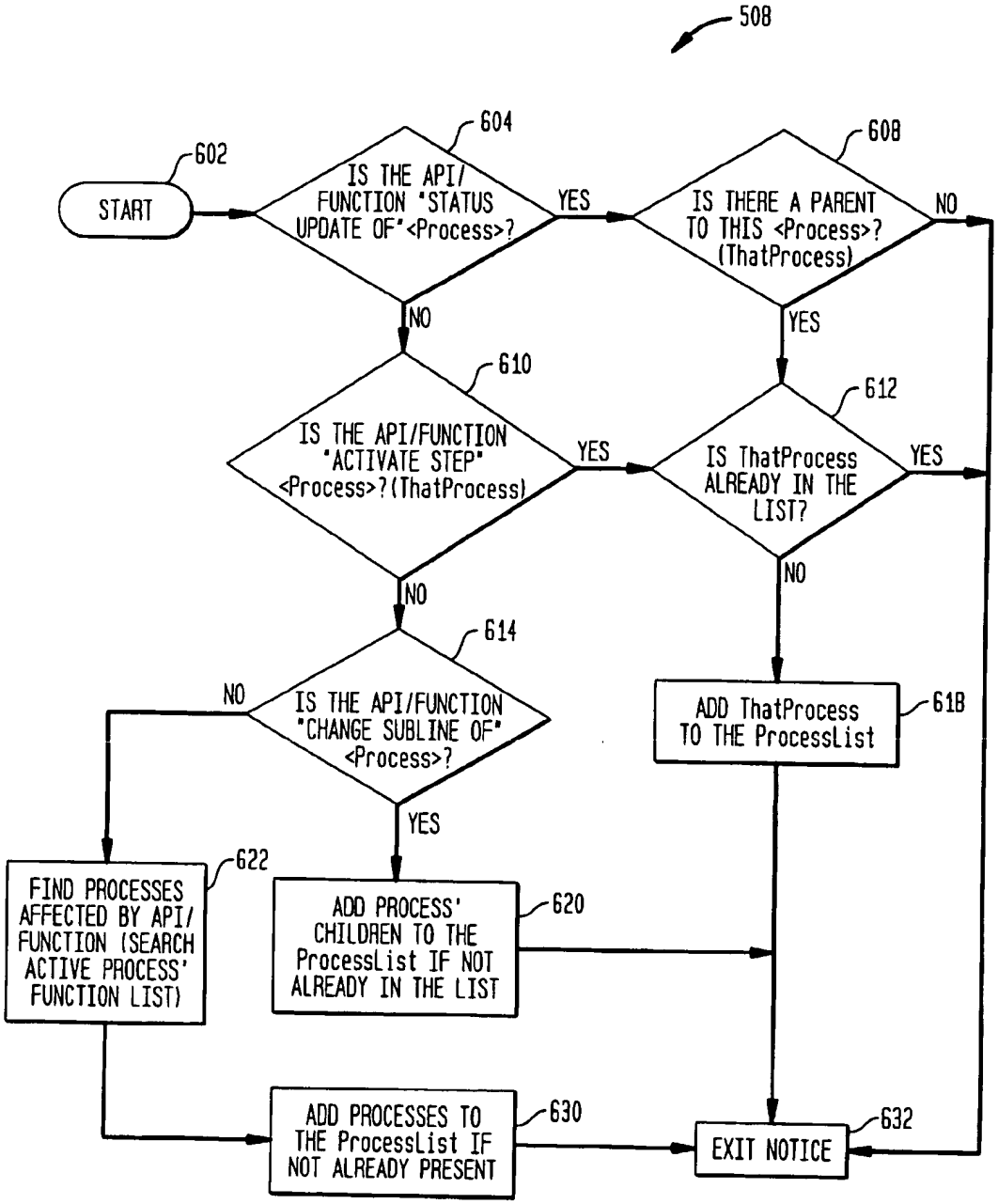


FIG. 7

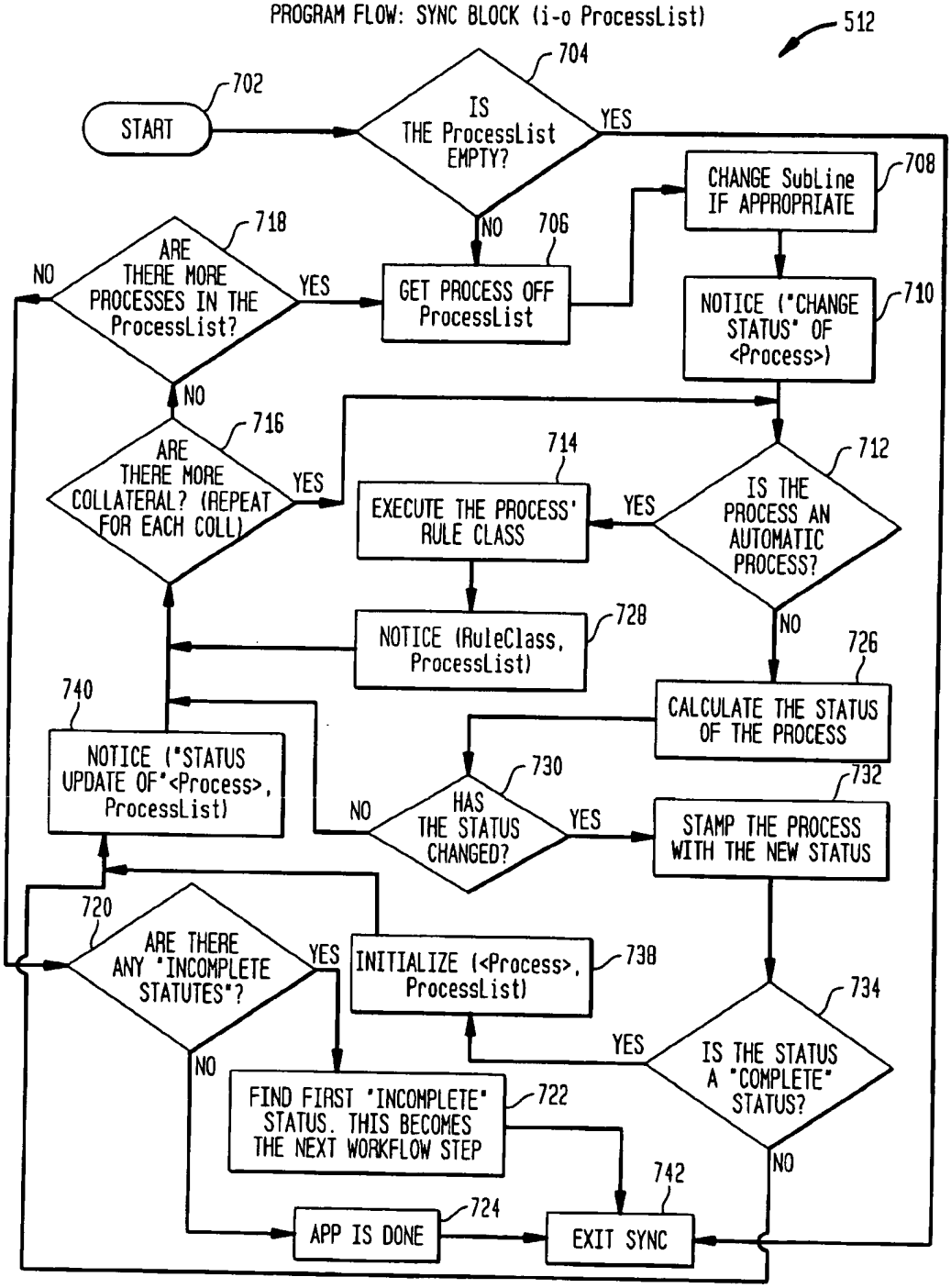

PROGRAM FLOW: SYNC BLOCK (i-o ProcessList)
512
START
702
IS THE ProcessList EMPTY?
704
YES
NO
706
GET PROCESS OFF ProcessList
CHANGE SubLine IF APPROPRIATE
708
NOTICE ("CHANGE STATUS" OF <Process>)
710
IS THE PROCESS AN AUTOMATIC PROCESS?
712
YES
EXECUTE THE PROCESS' RULE CLASS
714
NOTICE (RuleClass, ProcessList)
728
NO
CALCULATE THE STATUS OF THE PROCESS
726
HAS THE STATUS CHANGED?
730
NO
YES
STAMP THE PROCESS WITH THE NEW STATUS
732
IS THE STATUS A "COMPLETE" STATUS?
734
YES
NO
INITIALIZE (<Process>, ProcessList)
738
FIND FIRST "INCOMPLETE" STATUS. THIS BECOMES THE NEXT WORKFLOW STEP
722
ARE THERE ANY "INCOMPLETE STATUTES"?
720
YES
NO
APP IS DONE
724
EXIT SYNC
742
NOTICE ("STATUS UPDATE OF"<Process>, ProcessList)
740
ARE THERE MORE COLLATERAL? (REPEAT FOR EACH COLL)
716
YES
NO
ARE THERE MORE PROCESSES IN THE ProcessList?
718
YES
NO

FIG. 8

PROGRAM FLOW: INITIALIZE BLOCK (i ThisStep, i-o ProcessList)

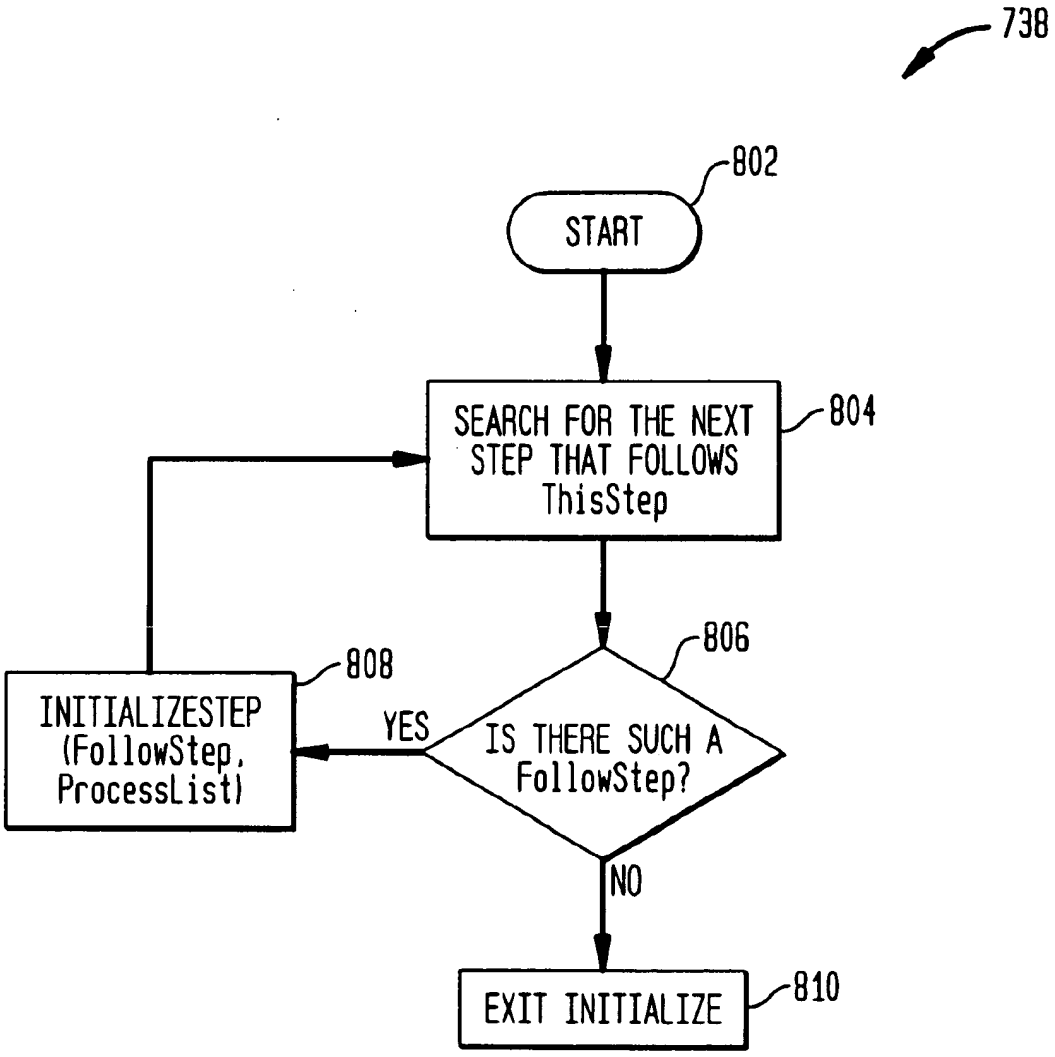


FIG. 9

PROGRAM FLOW: INITIALIZESTEP BLOCK (i ThisStep, i-9 ProcessList)

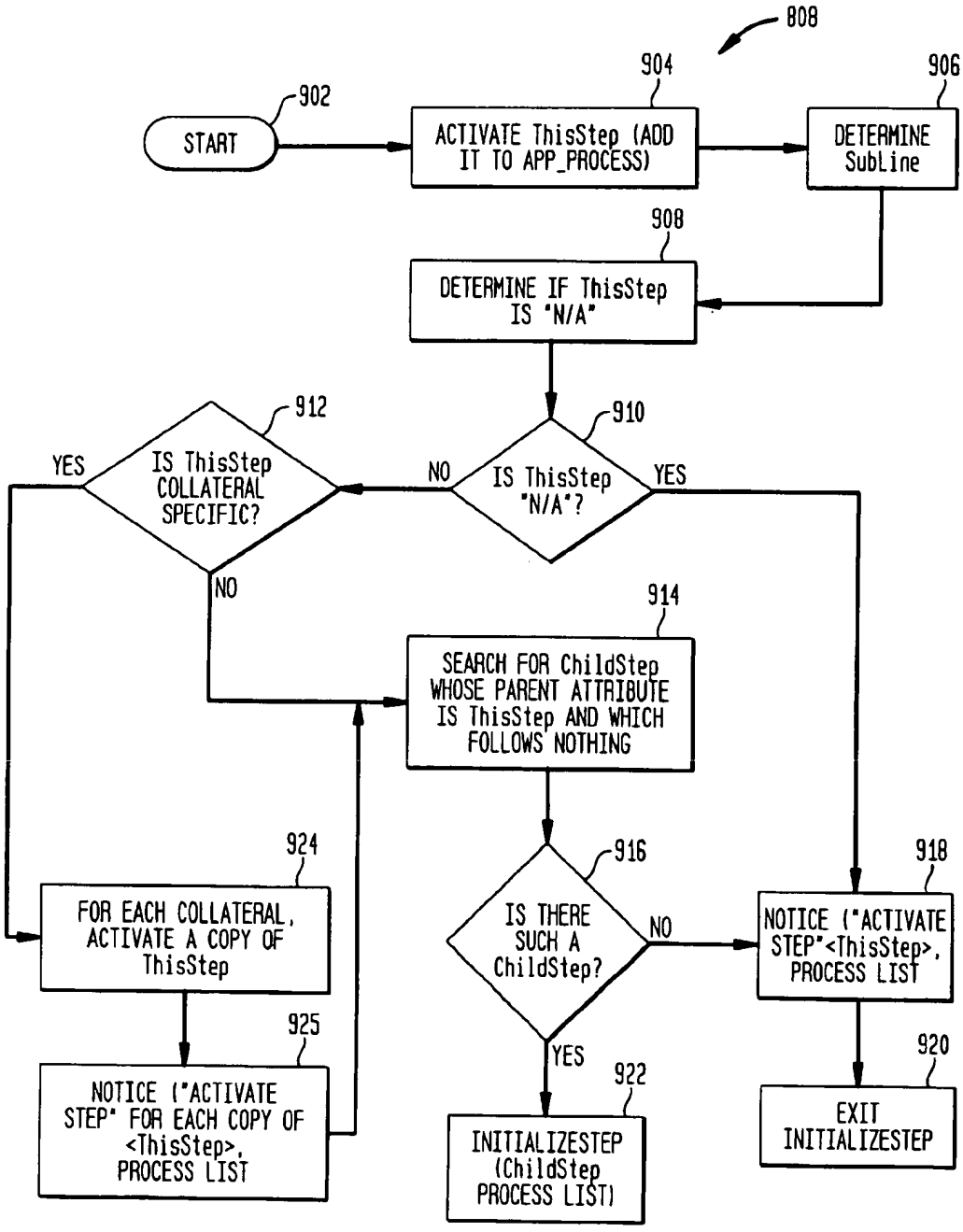
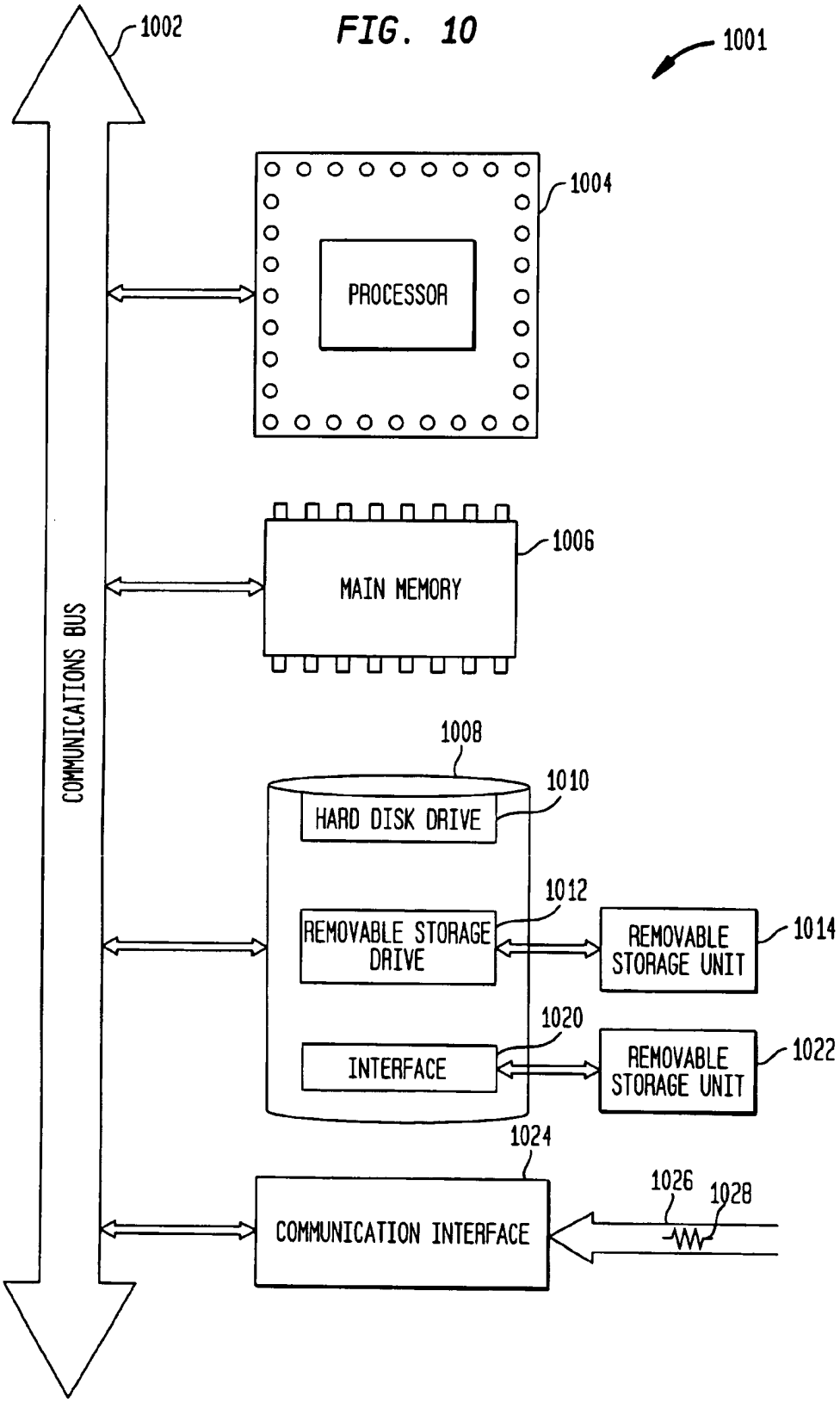


FIG. 10


1001
1002
COMMUNICATIONS BUS
1004
PROCESSOR
1006
MAIN MEMORY
1008
1010
HARD DISK DRIVE
1012
REMOVABLE STORAGE DRIVE
1014
REMOVABLE STORAGE UNIT
1020
INTERFACE
1022
REMOVABLE STORAGE UNIT
1024
COMMUNICATION INTERFACE
1026
1028

WORKFLOW MANAGEMENT SYSTEM FOR AN AUTOMATED CREDIT APPLICATION SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to an Automated Credit Application System and more particularly to a workflow management system for an Automated Credit Application System.

2. Related Art

Processing loan and credit applications is a complicated process involving numerous tasks that must be completed in a particular order by banks and other lending institutions. Such tasks include filling out a loan application, verifying financial and employment information, checking credit reports from one or more credit bureaus, verifying collateral, making the loan decision and administrating the loan.

These tasks are generally performed by multiple groups within a lending organization. For example, loan officers typically work with applicants to complete the credit application. An underwriter or underwriter group decides whether to issue or "book" the loan based on information from the credit application, current business guidelines, and information from outside agencies, such as credit bureaus and the like. An administrative group distributes payment coupons, receives loan payments and handles other administrative tasks during the life of the loan.

Generally, each task involves many steps which are conventionally performed manually by various people and organizations within the lending institution. The necessary participation between various work groups makes it difficult to manage the complicated process of preparing credit applications in an efficient manner.

Recently, a new tool has become available to financial institutions that alleviates many of the problems brought about using conventional manual loan processing techniques. These automated credit application systems automate many of the tasks that have conventionally been performed manually.

One such example of an automated credit application system is CreditRevue® by CMSI of Columbia Maryland. CreditRevue automates the loan application process from the inception of the loan application to loan administration. All data is gathered and handled electronically throughout the entire lending process according to unique requirements of each lending institution.

For example, CreditRevue provides loan officers with an on-line credit application that is customized for each lending institution according to their specific requirements. Once a credit application has been entered into the automated system, CreditRevue typically communicates with one or more credit bureaus to retrieve credit reports on behalf of the loan applicant.

CreditRevue can then make a credit decision based on scoring rules and other criteria as required by the lending institution. For example, automated credit decisions can be generated using a combination of advanced credit bureau analysis, multiple scoring models and judgmental review. The automated system can also monitor lending policy guidelines to ensure compliance from both a regulatory and managerial standpoint.

In addition, CreditRevue can assist in loan administration and prepare loans for booking by verifying documents and contract details. The system can also automate the transfer of a booked application to the lending institution's servicing system.

As stated, each lending institution generally has unique requirements for processing loans. For example, decision making rules are generally different among lending institutions. Workgroups and workgroup responsibilities are unique for each lending institution. Steps used to process loan applications and the order in which these steps are processed vary widely among lending institutions. Many of these parameters are also subject to change within single lending institution.

Because of the unique and dynamic nature of loan processing requirements, it is very difficult to provide an automated credit application system that will satisfy the needs of multiple lending institutions. Accordingly, providers of such systems must customize their software in order to comply with the unique requirements of their clients. Customization typically involves changing and adding source code modules to the base automated credit application system, This causes a significant increase in cycle time for development and testing. Clearly this customization is extremely costly for both the system providers, the lending institutions and ultimately, the consumer.

Workflow management is one area of automation that is subject to much customization. In general, workflow management defines and manages the credit processing steps that are needed to complete a credit application. This includes identifying individuals and/or workgroups that are responsible for completing each step in the credit application process.

Generally, workflow requirements vary widely among lending institutions. For example, one organization may require that an underwriting group or individual make final loan decisions based on information reported by the automated system. Another organization may desire to allow the automated system to approve loans based on automated analysis of predetermined criteria.

In another example, it may be desired to automate the loan approval process but also allow certain exceptions to be made by authorized workgroups or individuals. In this example, certain items that would otherwise cause a loan to be rejected can be waived by one or more authorized individuals or work groups.

As stated, providers of automated credit application systems customize their software according to the unique workflow requirements of each lending institution. Conventionally, workflow management is hard-coded according to the needs of each lending institution. For example, CreditReveu uses named stations to implement the workflow management system. Each named station is associated with one or more physical workstations that are connected to the automated credit application system. As the workflow progresses, outstanding process steps are processed only at the named stations associated with the particular process step.

Using this conventional method, users are forced to go to one of these named stations to access the credit application and to perform functions thereon to complete the credit application. In this fashion, credit applications are transferred from one named station to the next, depending on which steps are to be completed next.

For example, during application entry, the credit application is only accessible at the workstations associated with one or more loan officers. Similarly, during the underwriting stage, the credit application is only accessible at the workstations in the underwriting group.

Generally, in order to move the application along, users are forced to manually complete the outstanding steps at the associated named station. Once the step or steps are complete, users manually transfer the application to the next named station according to the customized preprogrammed workflow. Using the conventional method, the workflow is isolated in this fashion, and the processing of credit applications is performed in a serial manner that cannot be altered without having to re-customize the automated credit application system's source code.

Therefore what is needed is a workflow management system that provides additional flexibility so that the workflow is not restricted to serial processing using preprogrammed named stations. In addition what is needed is a workflow management system that can be customized according to requirements of lending institutions without having to customize the source code each time the workflow requirements change.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed toward a workflow management system for an automated credit application system that is flexible and can be easily customized according to individual requirements of financial institutions. The steps and rule tests that define an organization's workflow are customized according to workflow requirements and process steps for each organization. This is accomplished using the present invention without having to develop and change the source code associated with the automated credit application system. In particular, a workflow configuration tool is used at run-time to define customized workflow requirements. This alleviates that need to customize source code for each client and each time workflow requirements change.

The workflow management system of the present invention automatically manages the workflow and allows for application steps to be processed in a parallel fashion, rather than the serial method found in conventional systems. Workgroups are defined for each pre-configured workflow definition of the present invention. Each workgroup is associated with a particular set of functions that the workgroup has responsibility for. In addition, each workgroup has a workgroup queue associated with it. Workgroup queues contain all of the active steps associated with the workgroup. Active steps are workflow process steps that are currently pending and ready to be processed. Each workflow queue is automatically updated as soon as prerequisite steps are completed according to the customized workflow model.

In this fashion, users in a particular workgroup can for example, view all of the applications which have active steps pending for the workgroup. In another example a user can ask to see all of the pending applications in which a particular step needs to be completed. In addition, users can instantly view progress data related to credit applications being processed. For example, users can determine exactly what stage a credit application is in, and which workgroup or individuals have the responsibility to act next. Still further, users can determine precisely what conditions may be present that are preventing credit applications form progressing to completion.

The workflow management system of the present invention automatically coordinates the workflow among various workgroups and entities involved in the credit application process. The workflow management system of the present invention automatically controls and manages which process steps can be worked on by various workgroups simultaneously.

A relational database management system is used to link a plurality of rule tests with each workflow process step that is defined for particular workflow. Rule elements are linked to tests that are linked to database elements which are linked to functions that alter the database elements. Accordingly, when a function is executed, the workflow management system of the present invention automatically determines which particular workflow process steps are potentially affected by the executed function. Then, the workflow management system of the present invention evaluates those steps to determine their status (i.e. complete, incomplete, etc.), and determines which process steps are next activated.

BRIEF DESCRIPTION OF THE FIGURES

The present invention is described with reference to the accompanying drawings, wherein:

FIG. **1** is a block diagram depicting an operational environment according to a preferred embodiment of the present invention;

FIG. **2** is a block diagram depicting components of the workflow management module according to a preferred embodiment of the present invention;

FIG. **3** depicts a functional overview of the workflow management system that is useful for describing the interrelationships between workflow management elements according to a preferred embodiment of the present invention;

FIG. **4** depicts a block diagram of a workflow definition and a workflow configuration tool according to a preferred embodiment of the present invention;

FIGS. **5–9** are flowcharts depicting methods that can be used to implement the workflow management system according to a preferred embodiment of the present invention; and

FIG. **10** is a block diagram of a computer useful for implementing components of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** is a block diagram depicting an operational environment according to a preferred embodiment of the present invention. A computer system running an automated credit application system is shown as block **102**. The computer system **102** is coupled with a local area network (LAN) **108**. The LAN **108** is shown as an example only, and any type of computer network can be used. This includes multiple LANs coupled together with routers, leased telephone lines and/or public or private switched telephone networks to form wide area networks (WANs) and the like. The use of multiple private and public computer networks, such as the Internet, can also be used in alternate embodiments of the present invention. Typically however, the automated credit application system is coupled with one or more LANs, such as the LAN **108**, that is typically confined for security purposes, to a geographical location associated with a lending institution. This does not prohibit remote access to the LAN **108**, which may also be implemented in various embodiments of the present invention.

A plurality of workstations, W1, W2, . . . WN **106** is coupled with the LAN **108**. Generally, these workstations are directly or remotely attached to the LAN **108**, and are used to interact with the automated credit application system **102**. A database management system (DBMS) **104** is coupled with the LAN **108**. The DBMS **104** is used to store data associated with the automated credit application system

102. Preferably, a relational DBMS, such as Progress® DBMS provided by Progress Software Corporation of Bedford Massachusetts is used.

A preferred embodiment of the present is implemented using Progress® 4GL, provided by Progress Software Corporation of Bedford Mass. Progress 4GL is a high-level Forth-Generation development language used to create applications using object-oriented, event-driven and structured programming techniques. The use of Progress 4GL is an example of the preferred method of implementing the automated credit application system of the present invention. Other programming methods and tools can be used to implement alternate embodiments. Such alternate embodiments will be apparent to persons skilled in the relevant art(s), and are therefore within the purview of the claims listed below, which define the scope and breadth of the present invention.

A network device **110** is attached to the LAN **108** in the example operational environment shown in FIG. **1**. The network device **110** is used to connect the automated credit application system **102** with remote computers, such as the remote credit bureau computers, as depicted by the block **114**.

FIG. **2** is a block diagram depicting components of the workflow management module according to a preferred embodiment of the present invention. Block **202** represents users that interact with the workflow management component **200** via a user interface or Screen module **204** to perform Functions **206**, such as to interact with their workflow queue screen. For example, the application workflow queue screen is stored in the Screen module **204**.

Functions **206** can affect data elements **214** stored in the database **104**. Examples of functions stored in the function module **206** include the NOTICE and SYNC functions, which are subsequently described below with references to FIGS. **6** and **7**, respectively. A Rule module **208** stores tests and derives values for predetermined rule objects based on stored data elements in the database **104**. An example of a test stored in the Rules module **208**, is a test to determine whether a particular workflow step is complete.

Functions **206** allow users to perform actions. Functions **206** can be securable. That is, each function in the Function module **206** can be associated with a particular level of security so that only authorized personnel having that level of security or above can perform the specified function.

Functions **206** can read and/or write data elements **214** to the database **104**, and can affect rule objects in the Rules module **208**. Preferably, Functions **206** maintain a list of rule objects that they manipulate. Whenever a user **202** performs a Function **206** that changes one or more data elements **214** in the database **104**, at least one rule object in the Rules module **208** is typically modified. In this fashion, an automatic notification feature is provided to the workflow management module **200** so that it can dynamically and efficiently determine the status of workflow process steps (described below).

For example, the automatic notification feature of the present invention allows the workflow management module **200** to dynamically and efficiently determine which workflow process steps are completed, and which steps are to be performed next, in response to functions performed by users. Workflow process steps and their associated attributes are stored in the Internal Data module **212**. This feature of the present invention is described in detail below.

The Code Library module **210** is used to store library routines for the Screen module **204** and the Functions module **206**. Example of routines stored in the Code Library module **210** include common actions performed on screens, such as a browser function, and maintenance functions providing security for access requests, audit trails and the like. Other modules of the automated credit application system of the present invention that can access the workflow module **200** are represented by block **216**.

FIG. **3** depicts a functional overview of the workflow management system that is useful for describing the interrelationships between workflow management elements according to a preferred embodiment of the present invention. Block **302** represents functions **206** performed by users that cause a change to one or more database elements **214** in the database **104**. As depicted by block **304**, a database element is altered as a result of a database save action from a user. Each function has an associated set of rule elements **208**, as depicted by the block **306**. More specifically, each database element **214** has one or more rule elements **208** associated with it. A rule element is used to derive information from one or more database elements **214**. An example of a rule element is 'Total Income'. Total Income can be a summation of several database elements, including for example, 'primary income', 'secondary income' and 'alternate income'.

Each rule element **306** may be associated with one or more tests **308**. Tests are preferably of the BOOLEAN type and are either TRUE or FALSE. An example of a test **308** associated with the Total Income rule element is: 'If Total Income is Greater than $20,000, then the test object is TRUE.' The test object is used for example, to determine if a particular processing step is complete, or can be skipped.

Credit Application process steps are represented by block **310**. Steps **310** are tasks that users perform in the lending process that require completion in order to complete the credit application. Steps may be manually performed by users or automatically performed by the credit application system of the present invention. Each step **310** has a specific set of rules **306** associated with it. More specifically, each step **310** is associated with a specific set of tests **308** which are each associated with a specific set of rule elements **306**. As stated, each rule element **306** is associated with a database element **304**, which is associated with a function **302**.

In this fashion, because the association between process steps **310**, tests **308**, rule elements **306**, database elements **304** and functions **302**, the workflow management system of the present invention can determine what process steps **310** may be affected whenever a user (or the automated credit application system), performs a specified function **302**. This may or may not cause an update to a user or group workflow queue **312** (described below). This feature is referred to herein as an automatic notification feature and is represented by the dotted line **314** between the function block **302** and the steps block **310**.

The associations between workflow management elements **310**,**308**,**306**, **304** and **302** are preferably implemented with the use of a relational database management system, such as the relational DBMS **104**. Specific methods using database tables, indexes and database management tools, to relate these elements according to the descriptions provided herein, would be apparent to persons skilled in the relevant art(s) and are therefore not described in detail herein.

An example is presented below to further describe the automatic notification feature **314** of the present invention. In this example, a user performs a function **302** to modify

employment information. For example, a loan officer inputs an applicant's income into the credit application an saves the information.

When the loan officer saves the information, several database elements **304** are updated. For the purposes of this example, it is assumed that two database elements are updated, namely: 'primary income' and 'secondary income.'

In this example, it is assumed that the associated rule element **306** 'total income', is derived from the database elements of primary and secondary income. In this example the rule element **306** is derived as follows: 'Total Income= primary income+secondary income.'

Next, assume that a test **308** associated with the total income rule element was created. This test is referred to herein as "Verify" test. In this example, the Verify test is TRUE if the total income is greater than $20,000. Next, assume that a process step **310** exists that requires the applicant's income to be verified, only if the Verify test is TRUE. If the Verify test is FALSE, the process step is skipped.

Therefore, using the above example, the user action of inputting and saving the applicant's income to the database, causes the Verify test to be evaluated. If the test is TRUE, the process step becomes an active step in the workflow. If the test is FALSE, the process step is skipped. Accordingly, the appropriate workgroup queue(s) **312** are updated to include the process step only if the Verify test is TRUE.

Each workgroup defined in a workflow has an associated workflow queue **312**. The workflow queue lists each of the applications that have process steps which are currently active and may be performed by a member of the associated workgroup. Process steps are considered active whenever their associated prerequisite steps have been completed. Generally, users can view the workgroup queue according to customized constraints, such as viewing particular applications that need attention or particular workflow process steps.

It is important to note that the automatic notification feature **314** of the present invention provides for an efficient method to evaluate process steps. In this fashion, only process steps that may be affected by a particular function is evaluated in response to the function. This alleviates the need for the automated credit application system of the present invention to re-evaluate every process step in the workflow every time a function **302** is performed.

In addition, steps that have previously been completed are automatically re-evaluated whenever a function is performed that may affect that step. For example, a user may update information that was previously entered into the credit application. In this instance, it may be required to perform process steps that may have already been performed based on updated information, thus ensuring consistency of workflow throughout the application's life cycle.

As stated, process steps **310** are steps that require completion in order to complete the processing of a credit application. Process steps **310** may be manually completed by users or automatically completed by the automated credit application system. In addition, process steps may require custom routines to be executed in order to determine whether they are complete.

Preferably, the definition of process steps **310**, including the order in which they are performed, are specified by a user (or initially by the provider of the automated credit application system), with the use of a workflow configuration tool. The workflow configuration tool is also used to define workflow rule elements **306** and the workflow tests that are associated with the workflow process steps. The workflow configuration tool can be used by the end user (i.e. financial institution), the provider of the automated credit application system, or both, depending on the specific implementation of the present invention. In general the workflow configuration tool is used to create process steps **310** and associated tests **308**. Pre-created process steps are then selected to define a workflow for a particular financial institution.

FIG. **4** depicts a block diagram of a workflow definition and a workflow configuration tool according to a preferred embodiment of the present invention. A workflow configuration tool is depicted by the block **402**. In a preferred embodiment, the workflow configuration tool **402** allows users to define and select workflow process steps to build a workflow definition **404**. The workflow definition **404** is comprised of a plurality of workflow process steps. In this example, the process steps are depicted as the horizontal lines **418***a*, **418***b* . . . **418***n* (generally **418**). The workflow process **418** steps in this example are divided in sections, **406**,**408** and **410**, that represent application entry, underwriting and loan administration, respectively.

In a preferred embodiment, three types of steps **418** can be defined for a workflow **404** as indicated by block **414**. The types of steps are normal steps, exception steps, and automatic steps. Steps can also be categorized as manual steps, in which case, user action is required to complete the step, in addition to any associated tests. Generally, a user completes a checklist to indicate that a manual step is complete. Normal steps are individual action items that must occur to a credit application before it is considered complete. Exception steps are used to manage any exceptions encountered in the normal processing of credit applications. Exception steps are typically configured to follow the actual step that causes the exception. Automatic steps are steps that cause the automated credit application system to automatically run a function when the step becomes the next step in an application's workflow.

The automated credit application system of the present invention preferably maintains a library **210** of all unique processing steps in any workflow. To add a new step to a predefined workflow, the configuration tool **402** can select an existing step from this library **210**, or can create a new normal, automatic or exception step. When a new step **418** is created for a specific workflow **404**, it is also added to the library **210**, so that it can be used in other workflow definitions.

Preferably, steps **418** are defined in a particular order that represents the workflow of the application. Although processing steps in their specified order is not always required, the workflow **404** is built by adding steps **418** in their specified order. The workflow configuration tool **402** defines the order in which steps occur. Sometimes steps **418** can occur in any order. For example, the order in which the 'Verify Employment' and the 'Verify Residence' steps occur would be immaterial. One can precede the other and vice-versa. However, there may be instances where a specific step cannot occur until the completion of another step. For example, a step involving loan administration **410** cannot occur until an underwriting step **408** is completed in which the final credit decision is made.

An indicator **420** referred to herein as the 'follows step' indicator is associated with each step **418** to ensure that a step is added to the workflow **404**, only after a predecessor step has been completed. This prevents erroneous analysis of steps that are not ready to be processed. In the above example, the follows step indicator for the loan administra-

tion step is the final credit decision step. When a workflow **404** is built for an application, steps **418** are added to the workflow **404** according to the follows step indicator.

Steps **418** may be grouped together to form a block of steps. When this is done, the grouping step is referred to herein as the 'parent' and each individual step of the group is referred to as the 'child'. Child steps can also group additional steps, and in doing so, become parents steps themselves.

Accordingly, each step may have a parent and children. A step may also be standalone with no parent or children. Preferably, parents and children are created by indenting child steps from their parent step as presented by the workflow configuration tool **402**. A child step has an indicator **420** which identifies the parent step. This parent child relationship is depicted in FIG. **4** as indented horizontal lines that represent steps **418**. For example, because **418***b* is shown as being indented from step **418***a*, step **418***b* is a child of step **418***a*.

In addition, steps **418** can be tagged with a 'collateral-specific' indicator as shown by block **420**. This tag indicates that the processing step must be completed separately for each applicable collateral defined in the credit application.

As stated the workflow management system of the present invention uses workflow tests **308** to determine the status of steps have been completed. Preferably status definitions for workflow steps are shown in block **416** as incomplete, non-applicable, complete and waived. A status of complete is associated with steps that have been completed. Steps not completed have a status of incomplete. Steps that are waived are tagged with a waived status flag. Steps that are skipped are tagged with a N/A status flag.

Each workflow step **418** may be associated with one or more tests, as shown by block **412**. The workflow management system of the present invention uses tests **412** to build a workflow for an application and to define how a step **418** is processed. The step type **414** determines which tests **412** are needed to ensure the correct processing of the step. It should be recalled that in general, tests use rules which link activity with workflow steps so that when a function is performed, the workflow management system knows which steps may have been affected. Those steps are then evaluated using the associated tests to determine the status **416** of the potentially affected steps **418**.

When a user configures a workflow **404**, tests **412** are added to each step being defined. Thus, each step **418** has a one or more sets of associated tests **412**. As tests are added to steps, the functions that update the values used in the tests are tracked so that when the function is accessed the workflow management system knows which steps require analysis.

Preferably, three types of tests can be defined for workflow steps **418**. These types are shown as blocks **422** and **423**. As shown, Skip and completion tests **422**, preferably apply to step types **414** of normal. Exception tests **423** generally apply to exception step types **414**. Skip tests are used to determine the presence of a specified criteria that would cause the associated step **418** to be tagged with a status of N/A as shown by status block **416**. Steps **418** having a status **416** of N/A do not apply to the workflow, and are therefore skipped. For example, one step may be to send out a decline letter to the applicant. However, this step should be skipped if the applicant is granted a loan.

A completion test or test set **422** is tested to determine if the associated step is complete. When steps are complete, the next step which has follows step indicator **420** pointing to the completed step, can become active (i.e. ready to be performed). It should be recalled that active steps appear on at least one workflow queue **312**. For example, on the 'Enter Contract Information' step, the completion test may be 'Contract date is available.' Accordingly, when the test is evaluated and the workflow management system determines that a contract date is available, the step is marked complete and subsequent steps become active in the workflow.

The following is a list of some of the unique terms used to describe the present invention.

Processing Step (or step)	An individual action item that must occur to a credit application during its life cycle.
Function	Action or set of actions performed by a user or performed automatically by the present invention that causes data to be written to the database.
Tests	Set of instructions that tests or compares values on an application with other values or a predefined parameter and returns either TRUE or FALSE.
Completion Tests	Tests that are tested to determine if a step is complete.
Exception Tests	Tests that are only applicable for exception steps and act as both skip and completion tests for exception steps.
Skip Tests	Tests that are tested to determine if there is a special circumstance that would cause the step to not apply to the workflow and therefore be skipped.
Which to Use Tests (Sublines)	Tests that determine which set of skip and completion tests to use.
Automatic Step	Special type of step that causes the workflow management system to automatically run a function when the step becomes the next step in the application's workflow.
Exception Step	Special type of step used to manage any exceptions encountered in the normal processing of applications.
Manual Step	Step on which, regardless of the presence of completion rules, the user must indicate that the step is complete.
Next Step	Step to be completed next in an application's workflow. While several steps may be outstanding at any given time, only one step is the next step for any given workgroup.
Workgroups	Defined groups that contain one or more users, used to visualize applications to the people who work on them.

FIGS. **5**–**9** are flowcharts depicting methods that can be used to implement the workflow management system according to a preferred embodiment of the present invention. The WORKFLOW method **500** is depicted in FIG. **5**. The method begins with step **502**, where control immediately passes to step **504**. In step **504** a function **302** is executed which causes a write to the database **102** (also see block **304**). In step **506**, the WORKFLOW method **500** determines whether the executed function **302** is a 'Noticeable' function. Noticeable functions are functions that are associated with the evaluation of a credit application and write to the database **104**. This is in contrast to other functions that may be performed, such as maintenance functions and the like, which are not relevant to the workflow management system. A function is identified as being Noticeable through the use of a flag (or equivalent) stored in the database table row associated with the function.

As indicated by step **506**, if the executed function is not Noticeable, control passes back to step **504**, where essentially, the method **500** waits until another function is executed, and step **506** is repeated. If step **506** determines that the function from step **504** is Noticeable, control passes to step **508**.

In step **508**, another method referred to herein as 'NOTICE' is called. The NOTICE method **508** is used to update a list comprising active process steps **310** that need to be evaluated as a result of Noticeable executed functions.

Active process steps refer to steps that are ready to be executed. Active process steps are steps that appear on at least one workflow queue **312**. Evaluating a process step involves determining whether the status of a process step has changed because of the executed function. Tests **308** associated with a process step are used to make this determination. For example, a completion test set is used to determine if a process step has been completed. A skip test set is used to determine if a process step is non-applicable (N/A) or is to be skipped. A exception test set is used to determine if an exception should be made.

The NOTICE method **508** (described in detail below), essentially adds process steps to an internal list maintained by the workflow management system referred to herein as the 'processList'. Accordingly, the internal processList comprises a list of active process steps that need to be evaluated by the workflow management system of the present invention. It should be noted that the processList is an ordered list according to the hierarchy of the process steps. In this fashion, child steps are automatically evaluated before parent steps. This avoids the scenario of evaluating a parent step before a child step, and then having to immediately re-evaluate the parent step a second time, because the child step was just evaluated

After the NOTICE method **508** is executed, control passes to step **510**. In step **510**, the WORKFLOW method **500** determines if any additional functions have been executed. This can be true for example, if one or more additional functions have been executed while the workflow management system was processing step **508**. If so, control passes back to step **504**, and steps **504–510** are repeated until no additional functions are pending.

Next control passes to step **512**. In step **512**, another method referred to herein as the SYNC method is called. The SYNC method **512** essentially removes process steps from the processList, after being evaluated. The SYNC method **512** is described in detail below. Next, as step **514** indicates, the WORKFLOW method **500** ends. The WORKFLOW method **500** will be repeated whenever another function is executed.

An example of a method that can be used to implement the NOTICE method **508** will now be described with reference to FIG. **6**. The NOTICE method **508** begins with step **602**, where control immediately passes to step **604**. In step **604**, the method **508** determines if the noticeable executed function is a 'Status Update' type function. Preferably, function names indicate the type of function. In this example, certain internal functions having the type 'Status Update', 'Activate Step' and 'Change SubLine' are tested in steps **604**, **610** and **614**, respectively. The meaning of each of these function types are described below.

It should be noted that the three types of internal functions described above, are all executed by the SYNC method **512** (described below). The SYNC method **512** calls the NOTICE method **508** after executing the related internal function (See SYNC method **512**, steps **710**, **728** and **740**). Accordingly, the workflow manager of the present invention NOTICES functions that are executed by itself.

Referring back now to step **604**, the NOTICE method **508** determines if the function is of the type 'Status Update'. This indicates that the status **416** of the process step '<process>' was just updated. In this case, the parent step of <process> (referred to as ThatProcess) needs to be re-evaluated. Accordingly, as indicated by step **608**, the NOTICE method **508** determines if such a parent process step exists. If a parent process step does not exist, control passes to step **632**, where the NOTICE method **508** ends.

If a parent process step does exist, control passes to step **612**. In step **612**, the method determines if the parent process step is already included in the processList. If it is, then the NOTICE method **508** ends as indicated by step **634**. If the parent process step is not already present in the processList, then it is added to the processList in step **618**, and the method ends with step **632**.

Control passes to step **610**, if in step **604** it is determined that the function is not of the type 'Status Update'. In step **610**, the method determines if the function is of the type 'Activate Step'. This indicates that a process step (referred to as ThatProcess), has just been activated. If so, control passes to step **612**, where the method adds the process step to the processList, if it isn't already present, as indicated by steps **612** and **618**. This ensures that as steps are added during the lifecycle of the application, they are always evaluated at least one time. The NOTICE method **508** then ends with step **632**.

Control passes to step **614**, if the tests from steps **604** and **610** are both negative. In step **614**, the method determines if the function is of the type that changes a SubLine of a process step. A SubLine is a classification used to identify a particular set of completion tests, skip tests or exception tests (**422** and **423**) associated with a process step. It may be desirable at times, to change one or more of these set of tests for a particular step. In this fashion, the same process steps can be used in different workflows, each having different sets of rules or SubLines. Thus, a change SubLine function is provided for this purpose.

As step **614** indicates, if a change SubLine function has been executed for a process step, the child process steps are added to the processList (if not already present), as indicated by step **620**. The NOTICE method **508** then ends as indicated by **632**.

Control passes to step **622**, if the executed function is not of the three types tested in steps **604**, **610** and **614**. This represents usual processing for most functions that affect the status of a credit application. This is to be contrasted with the three previously mentioned special types of administrative internal functions originating essentially from the SYNC method **512**.

In step **622**, the NOTICE method **508** finds process steps that may be affected by the function that was just executed. Preferably, this is accomplished by searching function lists associated with each of the current active process steps. An active process step is a step that is currently pending and ready to processed. Specifically, in this example, active process steps have been initialized via the INITIALIZE method, which is called from the SYNC method **512**, and is subsequently described below. The effect of active process steps is that they appear in one or more workflow queues **312**, which indicates to users that the process step is ready to be processed.

As stated, the NOTICE method **508** finds process steps that need to be evaluated by searching each function list associated with each active process step. Function lists are preferably generated by the present invention before run-time to more efficiently find process steps that may be affected by functions during run-time. Function lists are a list of functions associated with a process step that can potentially affect the status of the process step. These function lists are new lists that are derived from the associations between the process steps **310**, tests **308**, rule elements **306**, database elements **304** and functions **302**. The function lists directly link process steps to functions that may affect them.

Next in step **630**, the process steps found in step **622** are added to the processList, if they are not already present. The NOTICE method **508** then ends as indicated by step **632**.

An example of a method that can be used to implement the SYNC method **512** will now be described with reference to FIG. **7**. The SYNC method begins with step **702**, where control immediately passes to step **704**. In step **704**, the method determines if the ProcessList is empty, and if so, the method ends, as indicated by step **742**. If the processList is not empty, control passes to step **706**. In step **706**, the first process step is retrieved from the processList.

Next, in step **710**, the SYNC method **512** determines whether the SubLine has changed, and if so, calls the NOTICE method **508**, to force the workflow management system to notice the change to the SubLine. Control then passes to step **712**. In step **712**, the method determines if the process step is of the type 'automatic' **414**. If it is, control passes to step **714**, where the automatic process step is automatically executed by the workflow management system. After the function associated with the automatic step has been executed in step **714**, the SYNC function calls the NOTICE method **508**, so that the appropriate process steps are evaluated in response to the automatically executed function. Control then passes to step **716**.

If step **712** determines that the process step is not an automatic step, control passes to step **726**. In step **726**, the SYNC method **512** calculates the status **416** of the process step. This is preferably accomplished by examining the tests **412** associated with the process step. For a normal step **414**, the SYNC method will examine the skip tests **422**, to determine if the step should be skipped. If the process step is not skipped then the completion tests **422** are examined. If all the completion tests pass, this indicates that the process step is now complete and the status **416** changes from incomplete to complete. If any of the completion tests are FALSE, the process step is not complete and the status **416** remains unchanged and incomplete.

If the process step is of the type exception **414**, the completion and skip tests **422** are the same. Accordingly, the rules **412** associated with an exception step are both the skip and completion rules. Thus, for exception steps, if at least one of the rules fail, an exception is indicated and the status **416** for the step is incomplete. This will prompt attention from a user, that action is required to complete the process step. Once the user performs the required action, these tests will be executed again. If at that time, all of the tests pass, the step will be tagged with a complete status. If all of the tests for an exception step pass the first time through, there is no exception and the rule is skipped. The status **416** for a skipped exception rule is non-applicable (N/A).

After the status of the process step is calculated in step **726**, control passes to step **730**. In step **730**, the SYNC method **512** determines if the new status is different from the previous status (i.e. if the status has changed). If so, the process step is stamped with the new status **416** as indicated by step **732**. Next, in step **734**, the SYNC method determines if the new status is a complete status **416**. If so, control passes to step **738**.

In step **738** another method referred to herein as INITIALIZE is called. The INITIALIZE method **738** essentially finds the next process step in the workflow and activates that step. The INITIALIZE method **738** is described in detail below. After calling the INITIALIZE method, control passes to step **740**, where the NOTICE method **508** is called in response to the status update of the process step.

If the status has not changed according to step **730**, control passes to step **716**. Control also passes to step **716** after step **728** as described above. In step **716**, the SYNC method **512** determines if the process step is 'collateral specific' **420**. If the process step is 'collateral specific' **420** the method loops back to step **712** and repeats the above method steps for each additional item of collateral listed in the credit application. Collateral specific **420** process steps are steps that need to be performed one time for each item of collateral listed in the credit application. Accordingly, if the current step is collateral specific, control passes back to step **712**, and the method steps are repeated for each item of collateral. If the process step is not collateral specific, or if the above method steps have been repeated for all associated items of collateral, control passes to step **718**.

In step **718**, the SYNC method **512** determines if there are additional process steps to processed in the processList. If so, control passes back to step **706**, and the method repeats the above described method steps for the next process step. If all process steps in the processList have been processed by the SYNC method **512**, control passes to step **720**. In step **720**, the method determines if there are any process steps remaining in the workflow that have a status **416** of 'incomplete.' If so, control passes to step **722**, where the SYNC method **512** finds the next set of steps having an incomplete status which are to become the next active steps in the workflow. This is accomplished with the use of the 'follow step' indicator **420**, as described above, for each of the completed steps. If there are no steps with a status of incomplete, the application is complete as indicated in step **724**. The SYNC method **512** ends with step **742**.

FIG. **8** is an example method that can be used as the INITIALIZE method according to a preferred embodiment of the present invention. The INITIALIZE method **738** essentially builds the workflow by activating process steps that depend from a process step whose status just changed to complete ('the completed step'), according to step **734** in the SYNC method **512**.

The INITIALIZE method **738** begins with step **802**, where control immediately passes to step **804**. In step **804** the method finds the next process step that follows the completed step. If there is such a step as determined in step **806**, control passes to step **808**. In step **808**, the next process step is initialized by calling another method referred to herein as INITIALIZESTEP. A method that can be used for the INITIALIZESTEP **808** is described below. After INITIALIZESTEP is called control passes back to step **804**, where the method is completed until there are no remaining steps that follow the current process step. Control then passes to step **810**, where the INITIALIZE method **738** ends.

FIG. **9** is an example method that can be used as the INITIALIZESTEP method according to a preferred embodiment of the present invention. In INITIALIZESTEP, one or more process steps are activated and become part of the processList. The INITIALIZESTEP method **808** begins with step **902**, where control immediately passes to step **904**. In step **904** the method activates the process step passed into the method, referred to as 'ThisStep'. It should be recalled that 'ThisStep' was determined to be the step that follows the completed step from the INITIALIZE method **738**, as determined in step **808** of that method.

As stated, a step is active when it becomes part of the current workflow and is ready to be processed. Active steps are steps whose predecessor steps have been completed. Next in step **906**, the INITIALIZESTEP method determines the SubLine of the process step. This is done in order to

determine if the process step has as status **416** of N/A and should therefore be skipped. This is accomplished by evaluating the skip rules **422** associated with the process step. If the process step is to be skipped, there is no need to activate the child steps associated of the process step. Accordingly, as step **910** indicates, if the process step has a status of N/A, control passes to step **918**, where the NOTICE method **508** is called so that the workflow management system knows to evaluate the status of the step. The method then ends as indicated by step **920**.

If the process step does not have a status **416** of 'N/A', control passes to step **912**. In step **912**, the INITIALIZESTEP method **808** determines whether the process step is 'collateral specific' **420**. If it is, control passes to step **924**, where a separate copy of the process step is activated for each collateral item in the credit application. Control then passes to step **925** where the NOTICE method **508** is called so that the steps just activated are noticed by the workflow management system. Control then passes to step **914**.

If step **912** determines that the process step is not collateral specific, control passes to step **914**. In step **914**, the method searches for a child step whose parent is 'ThisStep' and does not follow another step. That is, the method looks for a child step that does not depend on another step being completed. If such a step is found, this process INITIALIZESTEP is recursively called for the child step. If there is no such child step, control passes to step **918** where the child step is noticed by the workflow management system and method ends, as indicated by step **920**.

The present invention may be implemented using hardware, software or a combination thereof and may be implemented in a computer system or other processing system. In fact, in one embodiment, the invention is directed toward a computer system capable of carrying out the functionality described herein. An example computer system **1001** is shown in FIG. **10**. The computer system **1001** includes one or more processors, such as processor **1004**. The processor **1004** is connected to a communication bus **1002**. Various software embodiments are described in terms of this example computer system. After reading this description, it will become apparent to a person skilled in the relevant art how to implement the invention using other computer systems and/or computer architectures.

Computer system **1002** also includes a main memory **1006**, preferably random access memory (RAM), and can also include a secondary memory **1008**. The secondary memory **1008** can include, for example, a hard disk drive **1010** and/or a removable storage drive **1012**, representing a floppy disk drive, a magnetic tape drive, an optical disk drive, etc. The removable storage drive **1012** reads from and/or writes to a removable storage unit **1014** in a well known manner. Removable storage unit **1014**, represents a floppy disk, magnetic tape, optical disk, etc. which is read by and written to by removable storage drive **1012**. As will be appreciated, the removable storage unit **1014** includes a computer usable storage medium having stored therein computer software and/or data.

In alternative embodiments, secondary memory **1008** may include other similar means for allowing computer programs or other instructions to be loaded into computer system **1001**. Such means can include, for example, a removable storage unit **1022** and an interface **1020**. Examples of such can include a program cartridge and cartridge interface (such as that found in video game devices), a removable memory chip (such as an EPROM, or PROM) and associated socket, and other removable storage units **1022** and interfaces **1020** which allow software and data to be transferred from the removable storage unit **1022** to computer system **1001**.

Computer system **1001** can also include a communications interface **1024**. Communications interface **1024** allows software and data to be transferred between computer system **1001** and external devices. Examples of communications interface **1024** can include a modem, a network interface (such as an Ethernet card), a communications port, a PCMCIA slot and card, etc. Software and data transferred via communications interface **1024** are in the form of signals which can be electronic, electromagnetic, optical or other signals capable of being received by communications interface **1024**. These signals **1026** are provided to communications interface via a channel **1028**. This channel **1028** carries signals **1026** and can be implemented using wire or cable, fiber optics, a phone line, a cellular phone link, an RF link and other communications channels.

In this document, the terms "computer program medium" and "computer usable medium" are used to generally refer to media such as removable storage device **1012**, a hard disk installed in hard disk drive **1010**, and signals **1026**. These computer program products are means for providing software to computer system **1001**.

Computer programs (also called computer control logic) are stored in main memory and/or secondary memory **1008**. Computer programs can also be received via communications interface **1024**. Such computer programs, when executed, enable the computer system **1001** to perform the features of the present invention as discussed herein. In particular, the computer programs, when executed, enable the processor **1004** to perform the features of the present invention. Accordingly, such computer programs represent controllers of the computer system **1001**.

In an embodiment where the invention is implemented using software, the software may be stored in a computer program product and loaded into computer system **1001** using removable storage drive **1012**, hard drive **1010** or communications interface **1024**. The control logic (software), when executed by the processor **1004**, causes the processor **1004** to perform the functions of the invention as described herein.

In another embodiment, the invention is implemented primarily in hardware using, for example, hardware components such as application specific integrated circuits (ASICs). Implementation of the hardware state machine so as to perform the functions described herein will be apparent to persons skilled in the relevant art(s).

In yet another embodiment, the invention is implemented using a combination of both hardware and software.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for dynamically managing workflow for an automated credit application system in response to functions executed by a user or by the automated credit application system, comprising the steps of:

configuring a workflow for a credit application, comprising the steps of:

defining a plurality of workflow process steps, each said workflow process steps having an associated status, wherein said status can be complete or incomplete;

associating one or more tests with each of said workflow process steps;

relating one or more database elements with each of said tests; and

linking one or more functions with each of said database elements; and

processing a workflow for the credit application, comprising the steps of:

identifying an executed function, wherein said executed function can be executed by the user or by the automated credit application system;

finding a set of potentially affected workflow process steps comprising all workflow process steps associated with said executed function;

calculating the status of each workflow process step in said set of potentially affected workflow process steps;

dynamically determining, in response to said identifying step, said finding step and said calculating step, a next step for each said workflow process step in said set of potentially affected workflow process steps, in which said status changes from incomplete to complete according to said calculating step; and

associating a level of security with each of said functions and the user and wherein a particular function can only be executed by the user if the user is associated with the same or higher level of security as said particular function.

2. The method of claim **1**, wherein said configuring step further comprises the step of creating a function list associated with each said workflow process steps, each said function list comprising a list of functions associated with the corresponding workflow process step, wherein said function list is created by examining relationships between said workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking steps.

3. The method of claim **2**, wherein said processing step further comprises the step of:

creating a process list comprising a list of workflow process steps that are currently active; and

said finding step is accomplished by evaluating each said function list associated with each said workflow processing step that is currently active according to said process list.

4. The method of claim **2**, wherein said finding step is accomplished by evaluating each said function list associated with each said workflow processing step.

5. The method of claim **1**, wherein said finding step is accomplished by examining relationships between said workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking steps.

6. The method of claim **1**, wherein said processing step further comprises the step of creating a process list comprising a list of workflow process steps that are currently active.

7. The method of claim **1**, wherein said processing step further comprises the step of:

creating a process list comprising a list of workflow process steps that are currently active; and

said finding step is accomplished by examining relationships between said currently active workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking steps.

8. The method of claim **1**, wherein said calculating step comprises the step of evaluating said at least one said tests associated with each of said workflow process steps in said set of potentially affected workflow process steps.

9. The method of claim **1**, wherein said associating step comprises the step of associating one or more rule elements to one or more of said database elements, wherein each of said rule elements is associated with one or more of said tests.

10. A system to dynamically manage workflow for an automated credit application system in response to functions executed by a user or by the automated credit application system, comprising:

a function module comprising a plurality of functions, each of said functions can be executed by the user or by the automated credit application system;

a test module comprising a plurality of tests, each of said tests associated with at least one of said functions;

a data module comprising a plurality of workflow process steps for an credit application, each of said workflow process steps associated with at least one of said tests;

a notice module responsive to an executed function in said function module, wherein said notice module is used to identify which said workflow process steps for the credit application are associated with said executed function; and

a security feature coupled with said function module, wherein each of said functions and the user are associated with a level of security and wherein a particular function can only be executed by the user if the user is associated with the same or higher level of security as said particular function.

11. The system of claim **10**, further comprising:

a database element module, comprising a plurality of database elements, each of said database elements associated with at least one of said functions; and

a rules module comprising a plurality of rule elements, each of said rule elements associated with one or more of said database elements, and each of said rule elements associated with one or more of said tests.

12. The system of claim **10**, wherein said test module comprises completion tests, skip tests and exception tests.

13. The system of claim **10**, wherein said workflow process steps include an associated status, wherein said associated status can be incomplete, non-applicable, complete or waived.

14. The system of claim **10**, wherein said plurality of workflow process steps are organized in specified order.

15. The system of claim **10**, wherein said plurality of workflow process steps are organized in a hierarchy, wherein each said workflow process step can have a parent and a child.

16. The system of claim **10**, further comprising:

a calculate status module for calculating the status of each of said workflow process steps associated with said executed function; and

a dynamic module, responsive to said calculate status module, for dynamically determining the next process step of said workflow process steps to be executed.

17. A computer program product comprising a computer useable medium having computer program logic stored therein, said computer program logic for dynamically managing workflow for an automated credit application system in response to functions executed by a user or by the automated credit application system, wherein said computer program logic comprises:

configuring means for enabling the computer to configure a workflow for a credit application, comprising:

defining means for enabling the computer to accept from a user a definition for a plurality of workflow process steps, each said workflow process steps having an associated status, wherein said status can be complete or incomplete;

associating means for enabling the computer to associate one or more tests with each of said workflow process steps;

relating means for enabling the computer to relate one or more database elements with each of said tests; and

linking means for enabling the computer to link one or more functions with each of said database elements; and

processing means for enabling the computer to process a workflow for the credit application, comprising:

identifying means for enabling the computer to identify an executed function, wherein said executed function can be executed by the user or by the automated credit application system;

finding means for enabling the computer to find a set of potentially affected workflow process steps comprising all workflow process steps associated with said executed function;

calculating means for enabling the computer to calculate the status of each workflow process step in said set of potentially affected workflow process steps;

dynamic determining means, responsive to said identifying means, said finding means and said calculating means, for enabling the computer to determine a next step for each said workflow process step in said set of potentially affected workflow process steps, in which said status changes from incomplete to complete according to said calculating means; and

security means for associating a level of security with each of said functions and the user and wherein a particular function can only be executed by the user if the user is associated with the same or higher level of security as said particular function.

18. The computer program product of claim **17**, wherein said configuring means further comprises means for enabling the computer to create a function list associated with each said workflow process steps, each said function list comprising a list of functions associated with the corresponding workflow process step, wherein said function list is created by examining relationships between said workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking means.

19. The computer program product of claim **18**, wherein said processing means further comprises:

means for enabling the computer to create a process list comprising a list of workflow process steps that are currently active; and

said finding means is accomplished by evaluating each said function list associated with each said workflow processing step that is currently active according to said process list.

20. The computer program product of claim **18**, wherein said finding means is accomplished by evaluating each said function list associated with each said workflow processing step.

21. The computer program product of claim **17**, wherein said finding means is accomplished by examining relationships between said workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking means.

22. The computer program product of claim **17**, wherein said processing means further comprises means for enabling the computer to create a process list comprising a list of workflow process steps that are currently active.

23. The computer program product of claim **17**, wherein said processing means further comprises:

means for enabling the computer to create a process list comprising a list of workflow process steps that are currently active; and

said finding means is accomplished by examining relationships between said currently active workflow process steps, said tests, said database elements and said functions, according to relationships established by said associating, relating and linking means.

24. The computer program product of claim **17**, wherein said calculating means comprises means for enabling the computer to evaluate said at least one of said tests associated with each of said workflow process steps in said set of potentially affected workflow process steps.

25. A method for dynamically managing one or more workflow process steps for an automated credit application system in response to functions executed by a user or by the automated credit application system, comprising the steps of:

linking at least one rule test with each of the workflow process steps for a credit application;

linking at least one rule element with each of said rule tests;

linking each of said rule tests with at least one database element;

linking each of said database elements to at least one of the functions;

executing, by the user or by the automated credit application system, one of the functions, wherein the executed function alters said database elements,

determining which of the workflow process steps for the credit application is next activated; and

associating a level of security with each of said functions and the user and wherein a particular function can only be executed by the user if the user is associated with the same or higher level of security as said particular function.

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